OMRON

RFID System

V680 Series

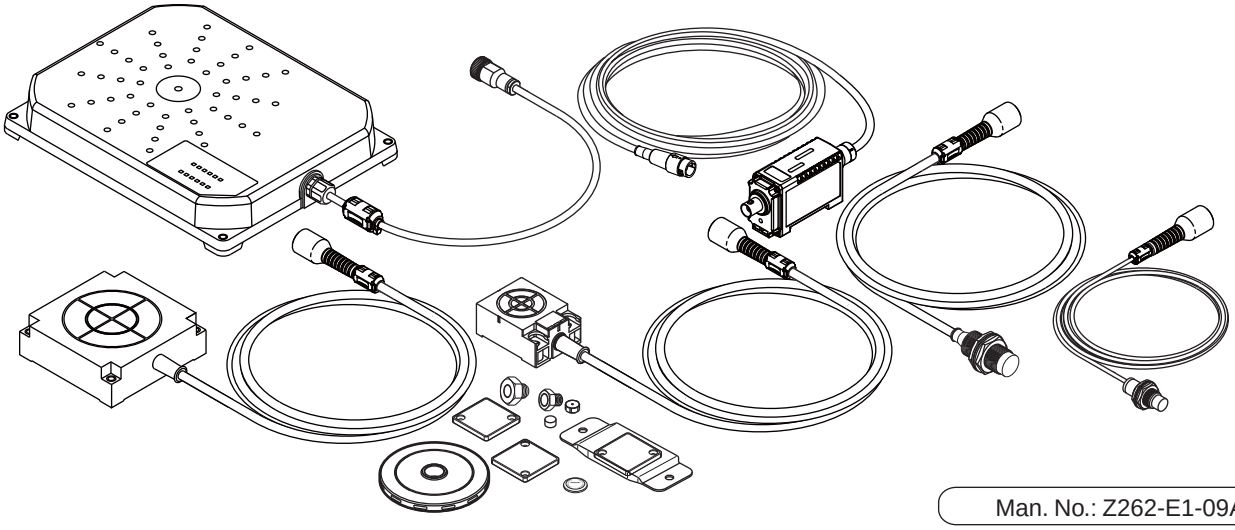
User's Manual for Amplifiers, Antennas, and RF Tags (EEPROM)

Amplifier and Antennas

V680-HA63A
V680-HS51
V680-HS52
V680-HS63
V680-HS65
V680-H01-V2

RF Tags

V680-D1KP52MT
V680-D1KP52M-BT01
V680-D1KP52M-BT11
V680-D1KP53M
V680-D1KP54T
V680-D1KP66T
V680-D1KP66MT
V680-D1KP66T-SP
V680-D1KP58HTN



Man. No.: Z262-E1-09A

Introduction

Thank you for purchasing a V680-series RFID System. This manual describes the functions, performance, and application methods needed for optimum use of the V680-series RFID System.

Please observe the following items when using the RFID System.

- Allow the RFID System to be installed and operated only by qualified specialist with a sufficient knowledge of electrical systems.
- Read and understand this manual before attempting to use the RFID System and use the RFID System correctly.
- Keep this manual in a safe and accessible location so that it is available for reference when required.

Introduction	READ AND UNDERSTAND THIS DOCUMENT
Section 1	Product Overview
Section 2	Specifications and Performance
Section 3	Communications Specifications
Section 4	Installation
Section 5	Chemical Resistance

RFID System

V680-HA63A	Amplifier
V680-HS51	Antenna
V680-HS52	Antenna
V680-HS63	Antenna
V680-HS65	Antenna
V680-H01-V2	Antenna
V680-D1KP52MT	RF Tag
V680-D1KP52M-BT01	RF Tag
V680-D1KP52M-BT11	RF Tag
V680-D1KP53M	RF Tag
V680-D1KP54T	RF Tag
V680-D1KP66T	RF Tag
V680-D1KP66MT	RF Tag
V680-D1KP66T-SP	RF Tag
V680-D1KP58HTN	RF Tag

User's Manual

READ AND UNDERSTAND THIS DOCUMENT

Please read and understand this document before using the products. Please consult your OMRON representative if you have any questions or comments.

WARRANTY

OMRON's exclusive warranty is that the products are free from defects in materials and workmanship for a period of one year (or other period if specified) from date of sale by OMRON.
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The following are some examples of applications for which particular attention must be given. This is not intended to be an exhaustive list of all possible uses of the products, nor is it intended to imply that the uses listed may be suitable for the products:

- Outdoor use, uses involving potential chemical contamination or electrical interference, or conditions or uses not described in this document.
- Nuclear energy control systems, combustion systems, railroad systems, aviation systems, medical equipment, amusement machines, vehicles, safety equipment, and installations subject to separate industry or government regulations.
- Systems, machines, and equipment that could present a risk to life or property.

Please know and observe all prohibitions of use applicable to the products.
NEVER USE THE PRODUCTS FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCT IS PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

PERFORMANCE DATA

Performance data given in this document is provided as a guide for the user in determining suitability and does not constitute a warranty. It may represent the result of OMRON's test conditions, and the users must correlate it to actual application requirements. Actual performance is subject to the OMRON Warranty and Limitations of Liability.

CHANGE IN SPECIFICATIONS

Product specifications and accessories may be changed at any time based on improvements and other reasons.
It is our practice to change model numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the product may be changed without any notice. When in doubt, special model numbers may be assigned to fix or establish key specifications for your application on your request. Please consult with your OMRON representative at any time to confirm actual specifications of purchased products.

DIMENSIONS AND WEIGHTS

Dimensions and weights are nominal and are not to be used for manufacturing purposes, even when tolerances are shown.

ERRORS AND OMISSIONS

The information in this document has been carefully checked and is believed to be accurate; however, no responsibility is assumed for clerical, typographical, or proofreading errors, or omissions.

PROGRAMMABLE PRODUCTS

OMRON shall not be responsible for the user's programming of a programmable product, or any consequence thereof.

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Precautions for Safe Use

Be sure to observe the following precautions to ensure safe use of the Products.

1. Do not use the Products in environments with flammable, explosive, or corrosive gasses.
2. Do not attempt to disassemble, repair, or modify any Product.
3. Tighten mounting screws securely.
4. Do not allow water or pieces of wire to enter from openings in the case. Doing so may cause fire or electric shock.
5. Turn OFF the Controller power supply before mounting or removing an Antenna or Amplifier.
6. Turn OFF the power supply to the Controller before changing settings.
   Attach a Setting switch protection Cover after setting Switch.
7. If an error is detected in any Product, immediately stop operation and turn OFF the power supply. Consult with an OMRON representative.
8. Dispose of the Products as industrial waste.
9. Observe all warnings and precautions given in the body of this manual.
10. Do not install the Products near equipment that generates a large amount of heat, such as a heater, transformer, or high-capacity resistor.
11. Because a cable has a locking mechanism, make sure that it has been locked before using the cable.
12. Do not open the back cover of the V680-H01-V2 antenna.
13. Do not touch the product immediately after usage at high temperatures. Doing so may occasionally result in burning.
14. When using a V680-D1KP58HTN, Make sure that the split pin is installed correctly to prevent the product from becoming detached.

Precautions for Correct Use

Always observe the following precautions to prevent operation failures, malfunctions, and adverse effects on performance and equipment.

1. Installation Environment

Do not use the Products in the following locations.

- Locations exposed to direct sunlight
- Locations exposed to corrosive gases, dust, metallic powder, or salts
- Locations not within the specified operating temperature range
- Locations subject to rapid changes in temperature or condensation
- Locations not within the specified humidity range
- Locations subject to direct vibration or shock outside the specified ranges
- Locations subject to spray of water, oil, or chemicals
- Locations subject to filled with steam

2. Installation

The Products communicate with RF Tags using the 13.56-MHz frequency band. Some motors, inverters, and switching power supplies generate noise that can affect communications with the RF Tags and cause errors. If such devices are located near the RF Tags, always test operation in advance to confirm whether the system will be affected.

- Observe the following precautions to minimize the effects of normal noise.
  (1) Ground all metal objects in the vicinity of the Products to 100 Ω or less.
  (2) Do not use the Products near high-voltage or high-current lines.
- Do not use non-waterproof Products in an environment where mist is present.
- Do not expose the Products to chemicals that adversely affect the Product materials.
- When mounting the Products, tighten the screws to the following torques.
  Do not apply screw loctite and any other organic solvent to any other parts than the screws.
  The casing may get cracked.
  V680-HS51: 6 N·m
  V680-HS52: 40 N·m
  V680-HS63: 1.2 N·m
  V680-HS65: 1.2 N·m
  V680-H01-V2: 1.2 N·m (Use the Mounting bracket of the attachment article.)
  V680-D1KP52M-BT01: 24.5 N·m
  V680-D1KP52M-BT11: 11 N·m
  V680-D1KP66T/-D1KP66MT: 0.5 N·m
  V680-D1KP66T-SP: 1.2 N·m
- Depending on the operating environment, the case surface may become fogged, but basic performance will not be affected.
- Do not pull the Antenna connector over the power of 30 N.
  The Antenna connector may be broken.
- If multiple Antennas are mounted near each other, communications performance may decrease due to mutual interference. Refer to *Installing Antennas on page 64* and check to make sure there is no mutual interference.
- When Antenna(only V680-H01-V2) is used in the United States and Canada, the ferrite core(ZCAT3035-1330) of the antenna's attachment is installed on controller's (V680-CA5D01-V□) DC power cable.
- Transmission will not be possible if the front and back panels are mistakenly reversed and the Unit is mounted to a metallic surface.
  V680-D1KP66MT
- The transmission distance will be reduced when the Unit is not mounted to a metallic surface.
  V680-D1KP66MT

- The maximum communications distance can be obtained when the Antenna faces the RF tag directly. When the Tag is installed at a tilt, the communications distance is reduced. Consider the effect of the Tag at a tilt when installing the Tag.
- Provide the mounting distances between plural RF tags to prevent them from malfunctions due to mutual interference.
- If the central axis of an antenna and RF tag shifts, a communications distance will fall.

3. Storage

Do not store the Products in the following locations.

- Locations exposed to direct sunlight
- Locations exposed to corrosive gases, dust, metallic powder, or salts
- Locations not within the specified storage temperature range
- Locations subject to rapid changes in temperature or condensation
- Locations not within the specified storage humidity range
- Locations subject to direct vibration or shock outside the specified ranges
- Locations subject to spray of water, oil, or chemicals
- Locations subject to filled with steam

4. Cleaning

- Do not clean the Products with paint thinner or the equivalent. Paint thinner, benzene, acetone, and kerosene or the equivalent will dissolve the resin materials and case coating.

5. Combination of the Amplifier

- With the amplifierV680-HA63A use only the RF tags of V680-D1KP52MT, V680-D1KP52M-BT01, V680-D1KP52M-BT11, V680-D1KP53M, V680-D1KP54T, V680-D1KP66T, V680-D1KP66MT, V680-D1KP66T-SP, or V680-D1KP58HTN. Do not use these RF Tags together with the V680-HA63B Amplifier.

6. Use at high temperatures (V680-D1KP58HTN)

- Data stored in memory in the RF Tag may be lost due to the characteristics of EEPROM, if the accumulated usage time of the RF Tag at a high temperature over 125°C exceeds 10 hours after writing data to the RF Tag.
- Do not communicate between the Antenna and the RF Tag in an environment where the ambient operating temperature is 85°C or higher.
  An error in communications between the Antenna and the RF Tag may occur.
- Do not use the commands using UID (unique identification number for each RF Tag) when the RF tag is used at a high temperature over 125°C. The UID may be lost due to the characteristics of EEPROM.
  - Do not use the READ ID command (command code: ID).
  - Do not make the UID Addition Setting (command code: US).
  - Communications specifications (FIFO trigger, FIFO repeat, multi-access trigger, multi-access repeat, and selective) can not be used.

For Use at high temperatures, refer to *RF Tags - Use at high temperatures (V680-D1KP58HTN) in Section 2 Specifications and Performance*.

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Meanings of Symbols

Indicates particularly important points related to a function, including precautions and application advice.

Indicates page numbers containing relevant information.

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MEMO

Section 1
Product Overview

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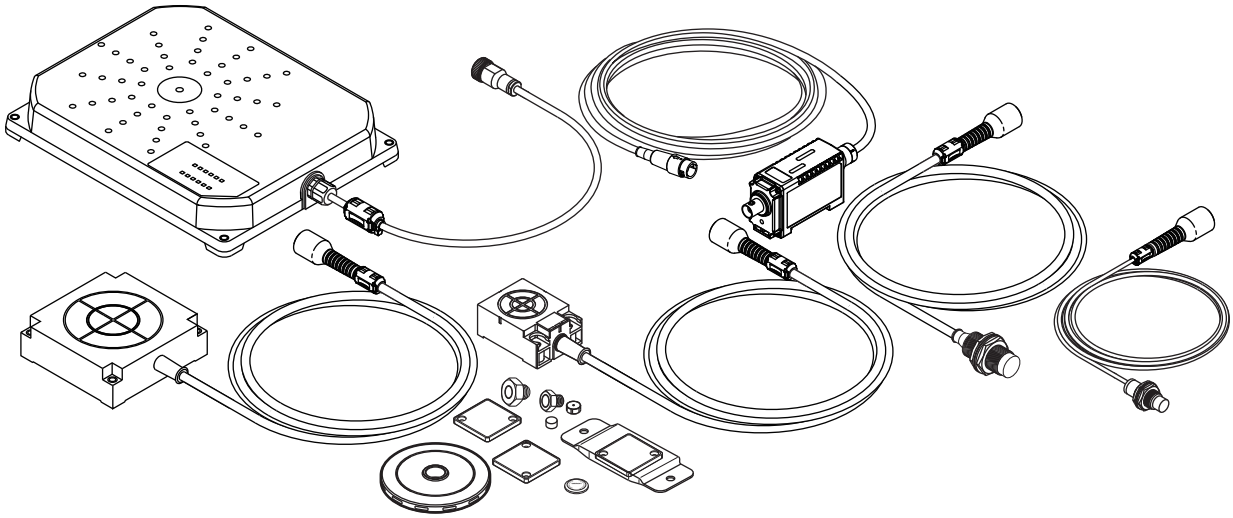
Features

The V680-series RFID System actively supports many different types of system, such as distributed-control systems and many-product, small-lot production systems, with non-contact data communications using electromagnetic induction.



■ Non-contact Data Communications

The V680 Series uses electromagnetic induction to enable non-contact, bi-directional data communications between Antennas and RF Tags.

■ EEPROM Memory

EEPROM (non-volatile memory) is used for RF Tag memory. No battery is required, so there is no need to be concerned about battery service life.

■ CRC Used for Transmission Error Detection

A bi-directional 16-bit CRC (Cyclic Redundancy Check) has been added as the error detection method for wire transmissions between ID Controllers and Antennas, and for wireless transmissions between Antennas and RF Tags. This method maintains superior communications reliability even where problems such as noise occur.

■ 1,000byte of Memory

RF Tags have 1,000byte of memory. In addition to the ID data required on-site, data such as model numbers and inspection information can be input.

■ 100,000 Data Rewrites at Normal Temperatures

When the RF Tag is used at temperatures of up to 25°C, each block of EEPROM data can be rewritten up to 100,000 times (in units of single block, 8-bytes).

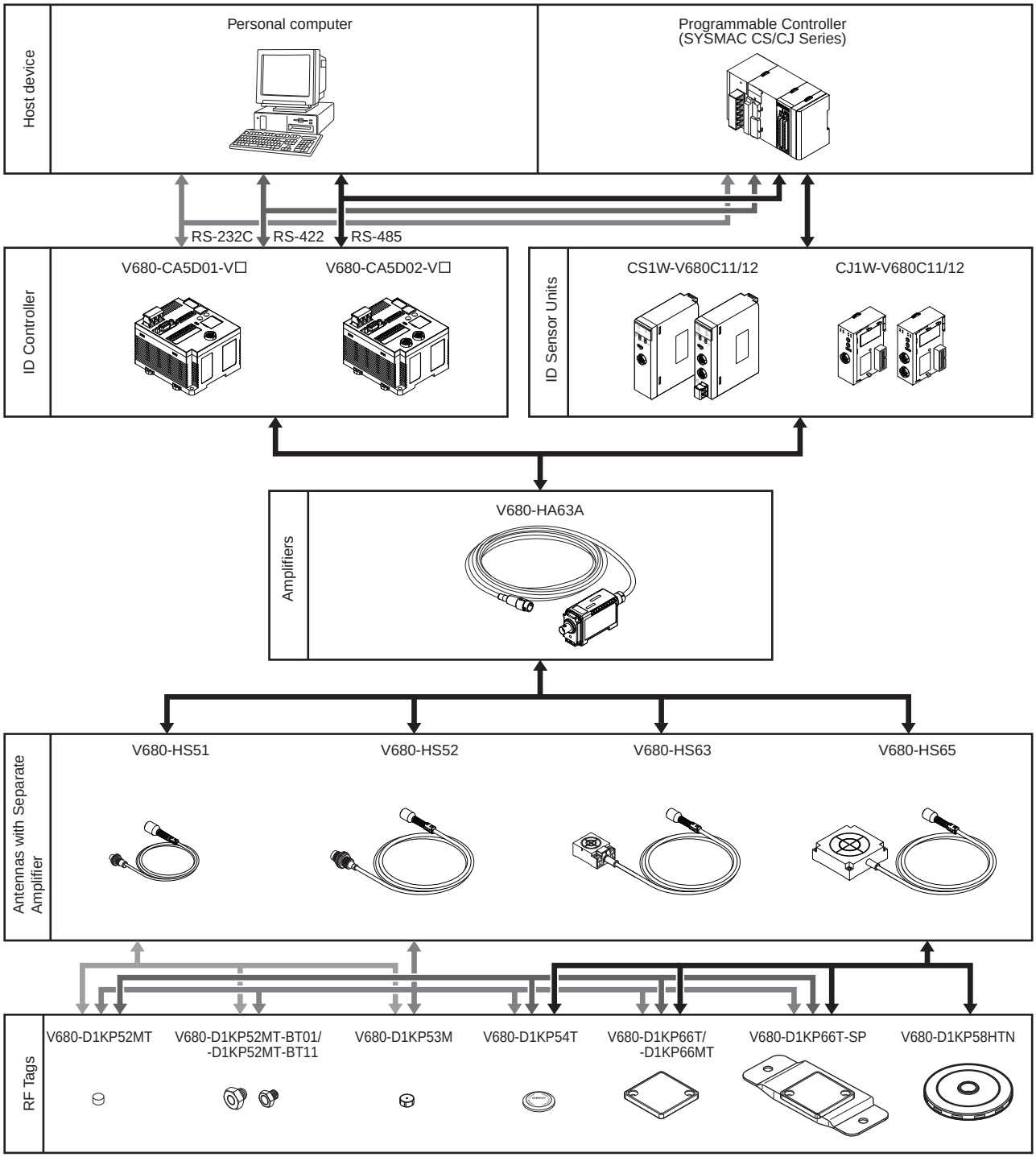
■ Superior Environmental Resistance and High Reliability

Antennas and RF Tags now have greater environmental resistance and are not affected by vibration, oil, or water.

Product Configuration

A V680-series RFID System consists of an ID Controller, one or more Amplifiers, one or two Antennas, and RF Tags. Select the models suitable for the application.

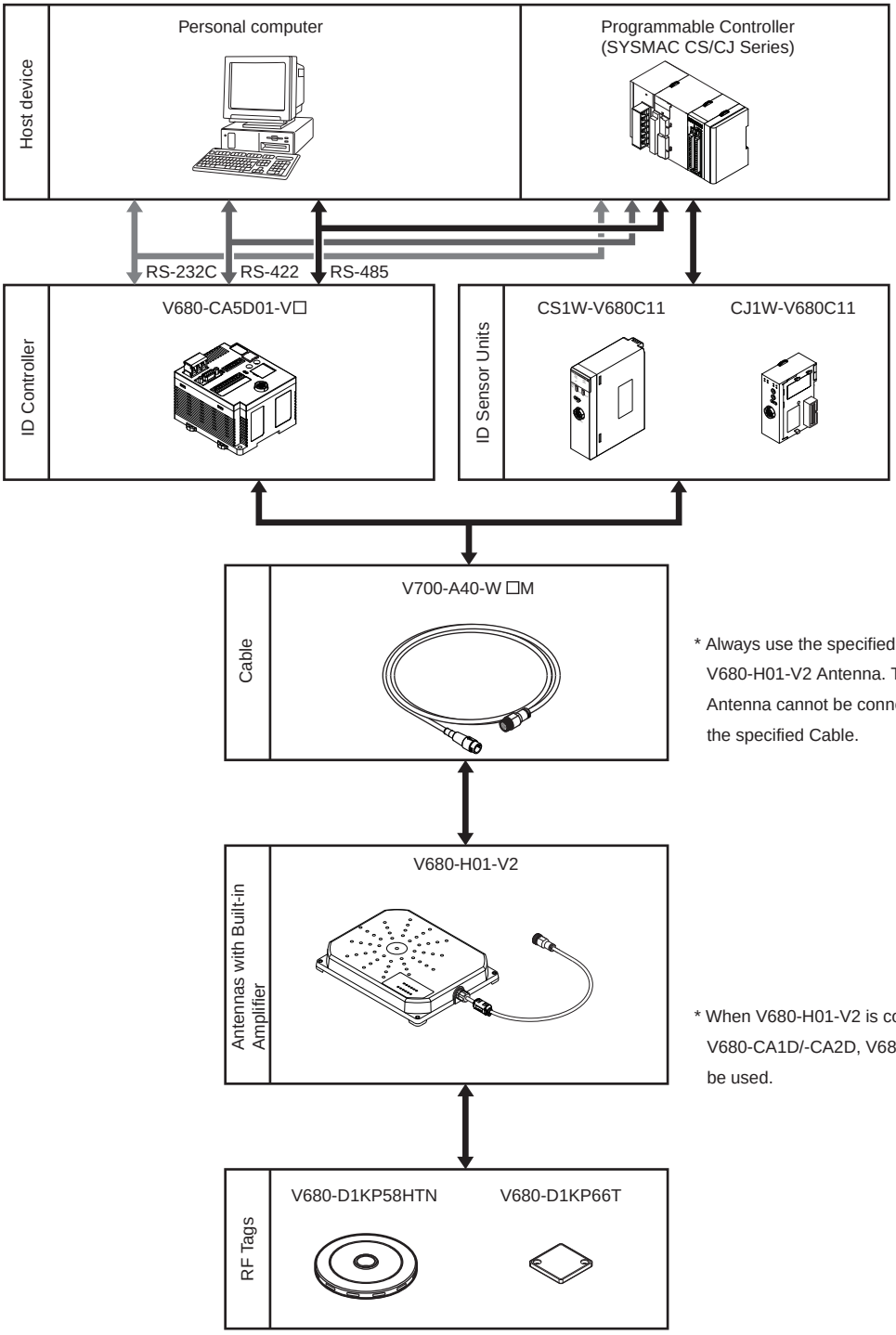
■ Using Antennas with Separate Amplifiers



CHECK! When embedding the V680-D1KP52MT and V680-D1KP53M into a metal surface, use the V680-HS51, V680-HS52 Antenna. Transmission will not be possible if the V680-HS63 Antenna is used.

CHECK! Use the V680-D1KP52MT, V680-D1KP52M-BT01, V680-D1KP52M-BT11, V680-D1KP53M, V680-D1KP54T, V680-D1KP66T, V680-D1KP66MT, C680-D1KP66T-SP, and V680-D1KP58HTN RF Tags in combination with only the V680-HA63A Amplifier, Do not use these RF Tags together with the V680-HA63B Amplifier.

■ Using a V680-H01-V2 Antenna with Built-in Amplifier



* Always use the specified Cable to connect a V680-H01-V2 Antenna. The V680-H01-V2 Antenna cannot be connected without using the specified Cable.

* When V680-H01-V2 is connected with V680-CA1D/-CA2D, V680-D1KP66T cannot be used.

Section 2
Specifications and Performance

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Antennas with Separate Amplifier

V680-HS51

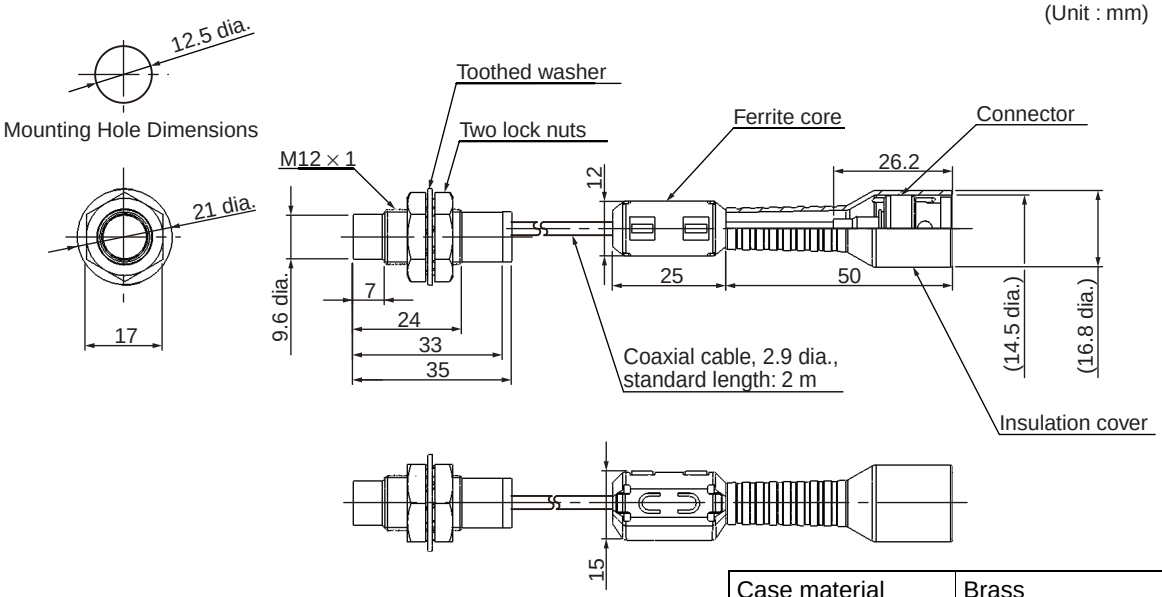
■ General Specifications

Item / Model	V680-HS51
Ambient operating temperature	-10 to 60°C (with no icing)
Ambient storage temperature	-25 to 75°C (with no icing)
Ambient operating humidity	35% to 95% (with no condensation)
Insulation resistance	20 MΩ min. (at 500 VDC) between connector terminals and case
Dielectric strength	1,000 VAC, 50/60 Hz for 1 min between connector terminals and case
Degree of protection	IP67.(IEC60529) Oil resistance equivalent to IP67g according to the former JEM standard. **Note:** The connectors are not waterproof.
Dielectric strength	10 to 2,000 Hz, 1.5-mm double amplitude, acceleration: 150 m/s², 10 sweeps in each of 3 axis directions (up/down, left/right, and forward/backward) for 15 minutes each
Shock resistance	1,000 m/s², 3 times each in 6 directions (Total: 18 times)
Dimensions	M12 × 35 mm
Material	ABS resin, brass, and epoxy resin filler
Weight	Approx. 55 g
Cable length	Standard lengths of 2 m

■ Dimensions

• V680-HS51

(Unit : mm)



Case material	Brass
Communications surface	ABS resin
Filling resin	Epoxy resin
Cable	PVC (black)

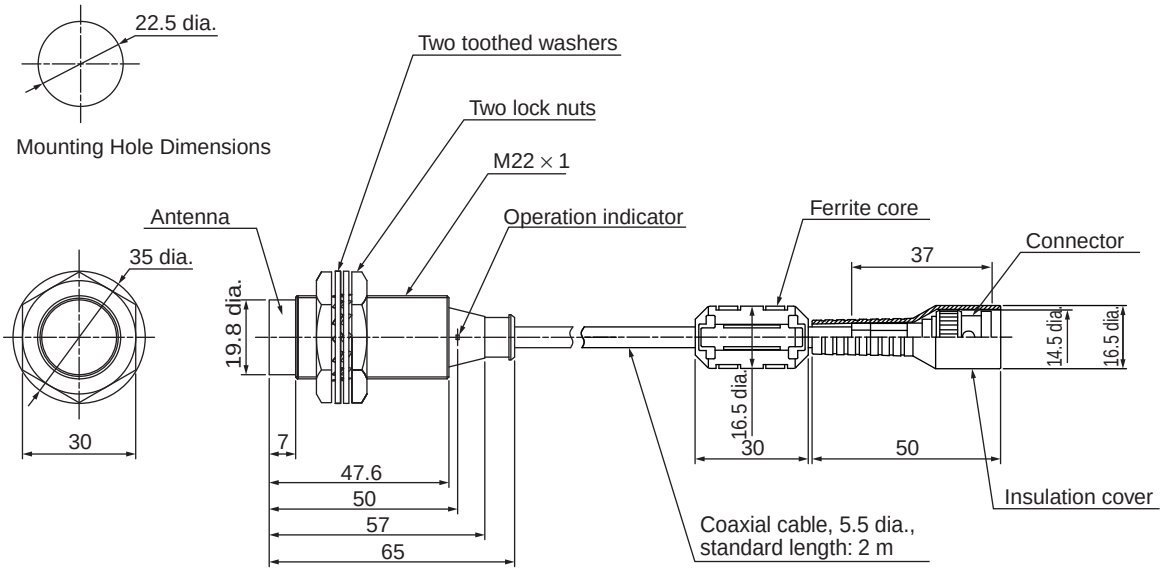
V680-HS52

■ General Specifications

Item / Model	V680-HS52-W (Standard cable, waterproof connector)	V680-HS52-R (Flexible cable, non-waterproof connector)
Ambient operating temperature	-10 to 60°C (with no icing)	
Ambient storage temperature	-25 to 75°C (with no icing)	
Ambient operating humidity	35% to 95% (with no condensation)	
Insulation resistance	20 MΩ min. (at 500 VDC) between connector terminals and case	
Dielectric strength	1,000 VAC, 50/60 Hz for 1 min between connector terminals and case	
Degree of protection	IP67.(IEC60529) Oil resistance equivalent to IP67g according to the former JEM standard. **Note:** The connector specifications are IP67 and IP65.(IEC60529)	IP67.(IEC60529) Oil resistance equivalent to IP67g according to the former JEM standard. **Note:** The connectors are not waterproof.
Dielectric strength	10 to 500 Hz, 1.5-mm double amplitude, acceleration: 100 m/s², 10 sweeps in each of 3 axis directions (up/down, left/right, and forward/backward) for 8 minutes each	
Shock resistance	500 m/s², 3 times each in 6 directions (Total: 18 times)	
Dimensions	M22 × 65 mm	
Material	ABS resin, brass, and epoxy resin filler	
Weight	Approx. 850 g (with 12.5 m cable)	
Cable length	Standard lengths of 2 and 12.5 m	

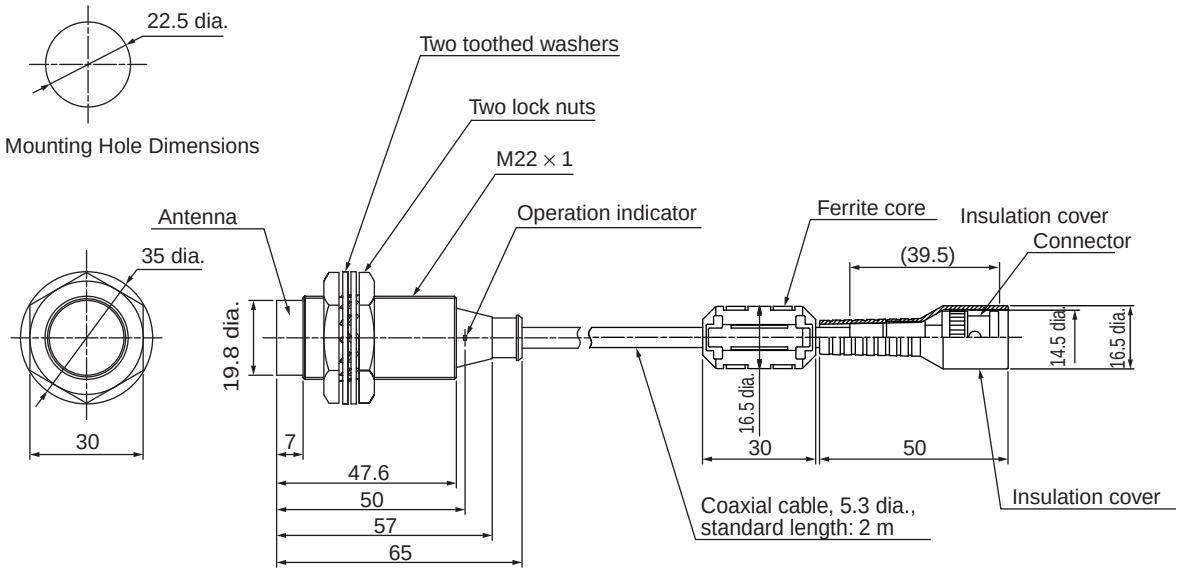
■ Dimensions

• V680-HS52-W



Case material	Brass
Communications surface	ABS resin
Filling resin	Epoxy resin
Cable	PVC (gray)

• V680-HS52-R



Case material	Brass
Communications surface	ABS resin
Filling resin	Epoxy resin
Cable	PVC (black)

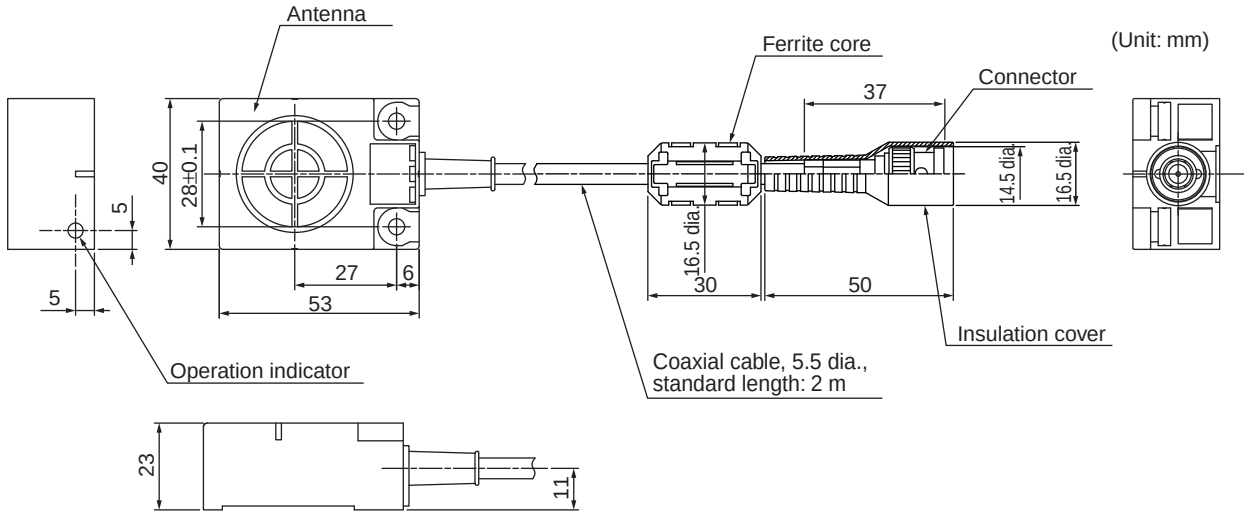
V680-HS63

■ General Specifications

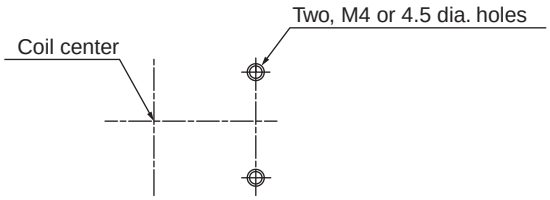
Item / Model	V680-HS63-W (Standard cable, waterproof connector)	V680-HS63-R (Flexible cable, non-waterproof connector)
Ambient operating temperature	-10 to 60°C (with no icing)	
Ambient storage temperature	-25 to 75°C (with no icing)	
Ambient operating humidity	35% to 95% (with no condensation)	
Insulation resistance	20 MΩ min. (at 500 VDC) between cable terminals and case	
Dielectric strength	1,000 VAC, 50/60Hz for 1 min between cable terminals and case	
Degree of protection	IP67.(IEC60529) Oil resistance equivalent to IP67g according to the former JEM standard. **Note:** The connector specifications are IP67 and IP65.(IEC60529)	IP67.(IEC60529) Oil resistance equivalent to IP67g according to the former JEM standard. **Note:** The connectors are not waterproof.
Vibration resistance	10 to 500 Hz, 1.5-mm double amplitude, acceleration: 100 m/s², 10 sweeps in each of 3 axis directions (up/down, left/right, and forward/backward) for 11 minutes each	
Shock resistance	500 m/s², 3 times each in 6 directions (Total: 18 times)	
Dimensions	40 × 53 × 23 mm	
Material	ABS resin case, epoxy resin filler	
Weight	Approx. 850 g (with 12.5 m cable)	
Cable length	Standard lengths of 2 and 12.5 m	

■ Dimensions

• V680-HS63-W

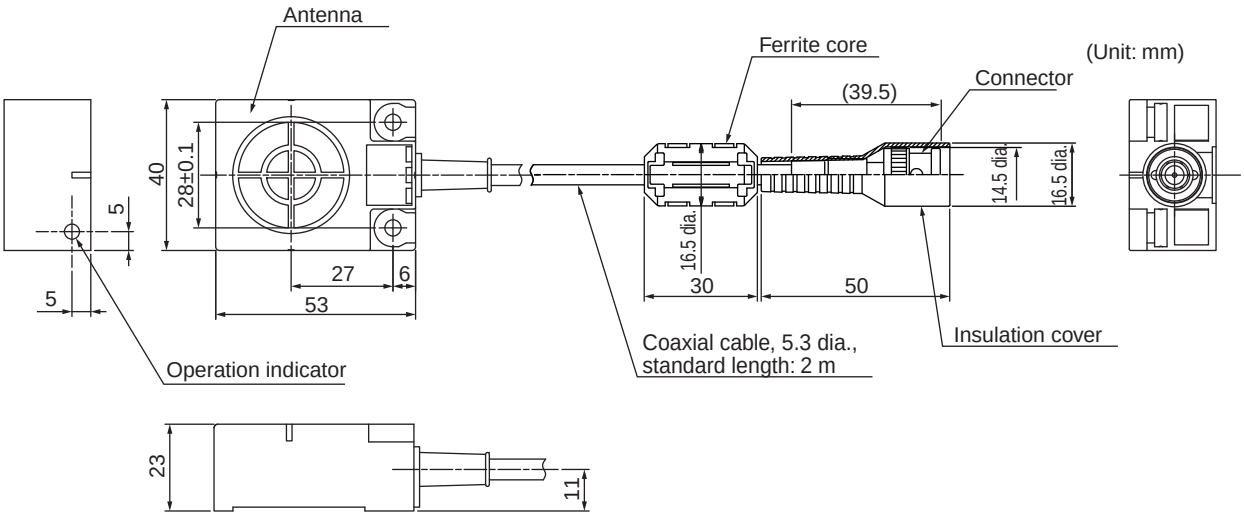


Note: Mounting Hole Dimensions

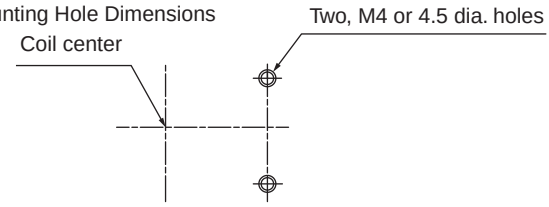


Case material	ABS resin
Filling resin	Epoxy resin
Cable	PVC (gray)

• V680-HS63-R



Note: Mounting Hole Dimensions



Case material	ABS resin
Filling resin	Epoxy resin
Cable	PVC (black)

V680-HS65

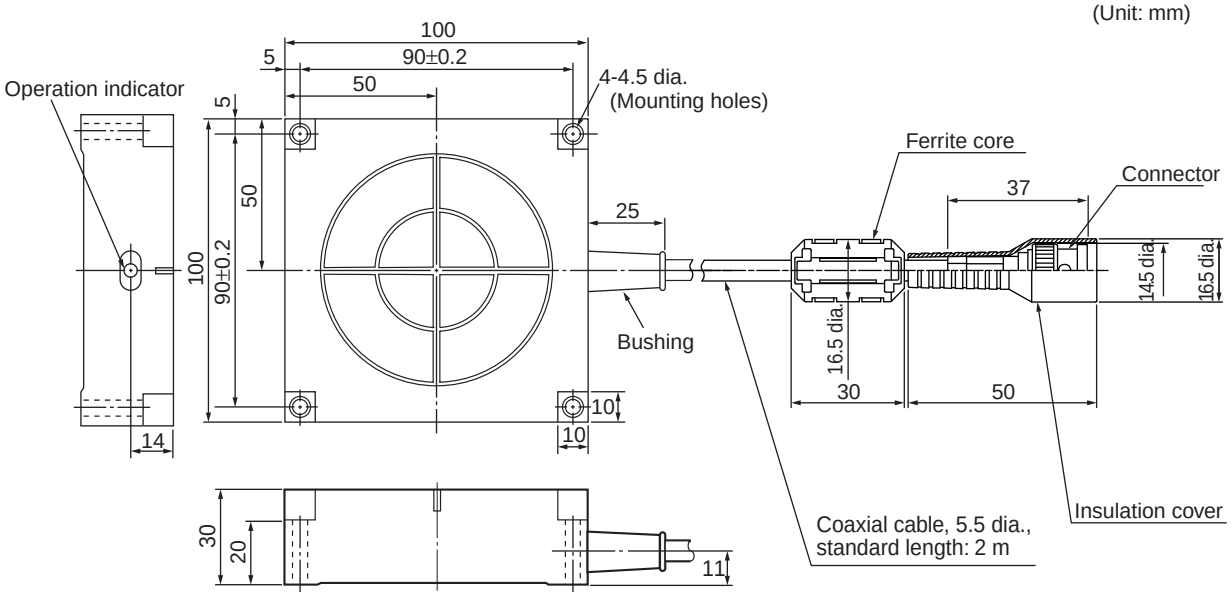
■ General Specifications

Item / Model	V680-HS65-W (Standard cable, waterproof connector)	V680-HS65-R (Flexible cable, non-waterproof connector)
Ambient operating temperature	−25 to 70°C (with no icing)	
Ambient storage temperature	−40 to 85°C (with no icing)	
Ambient operating humidity	35% to 95% (with no condensation)	
Insulation resistance	20 MΩ min. (at 500 VDC) between connector terminals and case	
Dielectric strength	1,000 VAC, 50/60 Hz for 1 min between connector terminals and case	
Degree of protection	IP67 (IEC60529) Oil resistance equivalent to IP67g according to the former JEM standard. **Note:** The connector specifications are IP67 and IP65 (IEC 60529).	IP67 (IEC60529) Oil resistance equivalent to IP67g according to the former JEM standard. **Note:** The connectors are not waterproof.
Dielectric strength	10 to 500 Hz, 1.5-mm double amplitude, acceleration: 100 m/s², 10 sweeps in each of 3 axis directions (up/down, left/right, and forward/backward) for 11 minutes each	
Shock resistance	500 m/s², 3 times each in 6 directions (Total: 18 times)	
Dimensions	100 × 100 × 30 mm	
Material	ABS resin case, epoxy resin filler	
Weight	Approx. 1100 g (with 12.5 m cable)	
Cable length	Standard lengths of 2 and 12.5 m	

■ Dimensions

• V680-HS65-W

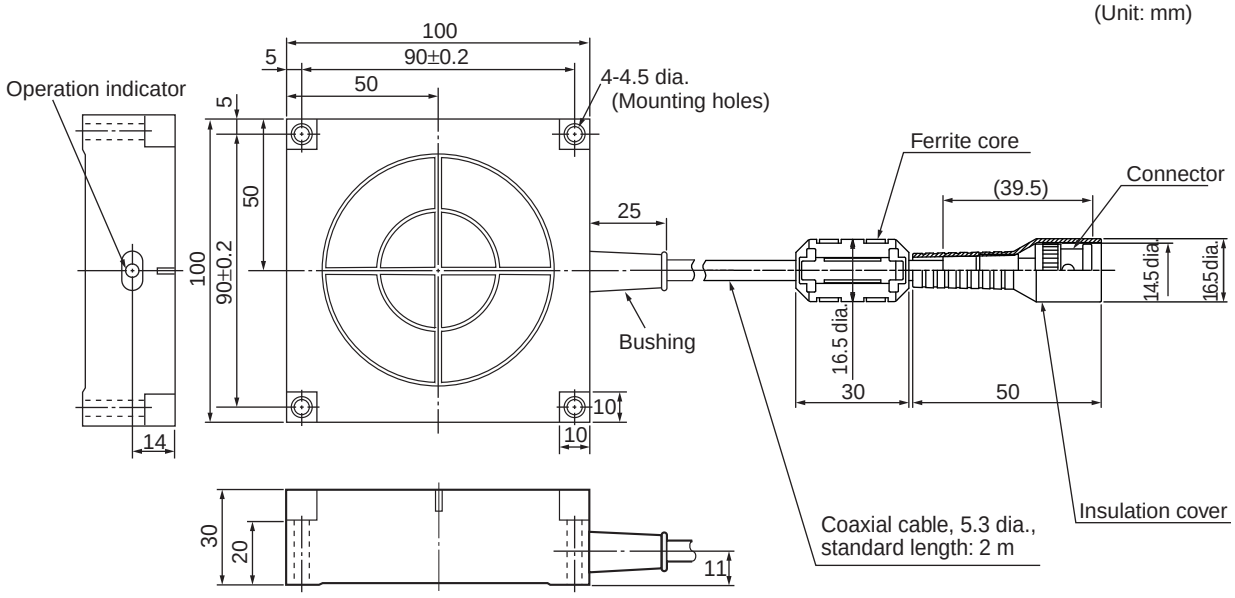
(Unit: mm)



Case material	ABS resin
Filling resin	Epoxy resin
Cable	PVC (gray)

• V680-HS65-R

(Unit: mm)



Case material	ABS resin
Filling resin	Epoxy resin
Cable	PVC (black)

Antennas with Built-in Amplifier

V680-H01-V2

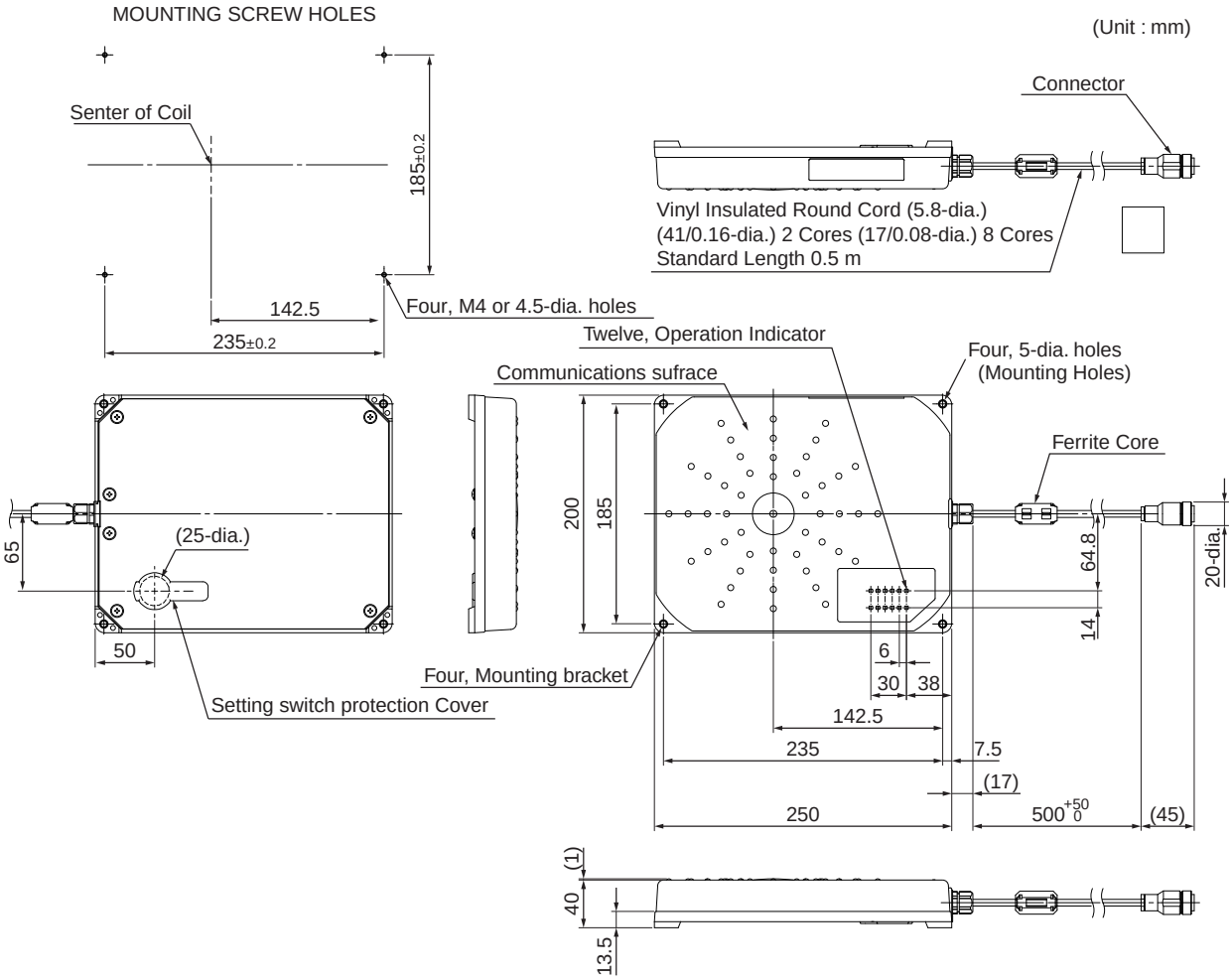
■ General Specifications

Item / Model	V680-H01-V2
Ambient operating temperature	-10 to 55°C (with no icing)
Ambient storage temperature	-35 to 65°C (with no icing)
Ambient operating humidity	35% to 85% (with no condensation)
Insulation resistance	20 MΩ min. (at 100 VDC) between connector terminals and the rear plate
Dielectric strength	1,000 VAC, 50/60 Hz for 1 min between connector terminals and the rear plate
Degree of protection	IP63.(IEC60529); Mounting direction: Communications surface facing up
Dielectric strength	10 to 150 Hz, 0.35-mm single amplitude, acceleration: 50 m/s^2, 10 sweeps in each of 3 axis directions (up/down, left/right, and forward/backward) for 8 minutes each
Shock resistance	150 m/s^2, 3 times each in 6 directions (Total: 18 times)
Cable length	0.5 m (use an relay cable to connect to the Controller up to 30.5 m)
LED indicators	RUN, COMM, NORM, ERR, CNT-TYPE, TAG-TYPE, Error Code, Level
Weight	Approx. 900 g

■ Communications Specifications

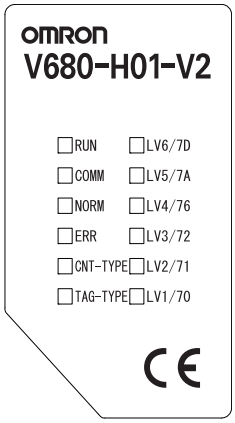
Item / Model	V680-H01-V2
Communications method	Electromagnetic induction
Operating frequency	13.56 MHz ± 7KHz
Modulation	ASK

■ Dimensions



Case material	PC/ASA resin
Rear Panel	Aluminum
Cable	PVC

■ Operation Indicator



name	Color	Meaning
RUN	Green	Lit when the power is ON.
COMM	Yellow	Lit when a command is being sent.
NORM	Green	Lit when communications with a RF Tag are normal in Normal Communications Mode.
ERR	Red	Lit when an error occurs in communications with a RF Tag in Normal Communications Mode.
CNT-TYPE	Yellow	Lit when in V680-CA**1**D/-CA2D Controller connection mode (SW1-1 setting: ON).
TAG-TYPE	Yellow	Lit when in V680-D□KF□□ RF Tag mode (SW1-2 setting: ON).
LV6/7D	Yellow	Maintenance Mode: Lit at distance or speed level 6. Normal Communications Mode: Lit when a write protection error occurs.
LV5/7A	Yellow	Maintenance Mode: Lit at distance or speed level 5 or higher. Normal Communications Mode: Lit when an address error occurs.
LV4/76	Yellow	Maintenance Mode: Lit at distance or speed level 4 or higher. Normal Communications Mode: Lit when a RF Tag memory error occurs.
LV3/72	Yellow	Maintenance Mode: Lit at distance or speed level 3 or higher. Normal Communications Mode: Lit when a no RF Tag error occurs.
LV2/71	Yellow	Maintenance Mode: Lit at distance or speed level 2 or higher. Normal Communications Mode: Lit when a verification error occurs.
LV1/70	Yellow	Maintenance Mode: Lit at distance or speed level 1 or higher. Normal Communications Mode: Lit when a RF Tag communications error occurs.

CHECK!

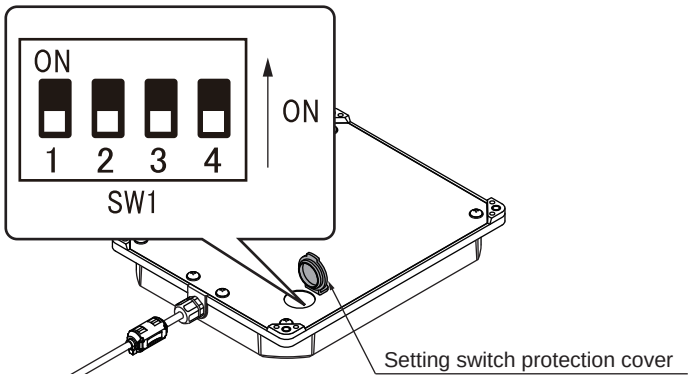
The distance level will vary greatly depending on the surrounding environment. The setting position will serve as a guide, but use RUN mode to conduct a sufficient number of tests in the actual operating environment.
Values of distance level 6 may not be displayed, but this will not affect the RUN mode performance and does not indicate a malfunction.

CHECK!

Differences between the V680-H01 and the V680-H01-V2
As shown in the following table, the V680-H01-V2 provides additional indicators.
Turn ON SW1-1(Antenna) when using the V680-CA1D/CA2D.
Only when the V680-D1KP58HTN is used, it is possible to set it.

display functions	V680-H01-V2		V680-H01
	SW1-1: OFF	SW1-1: ON	no switch
RUN (POWER/COMM)	OK	OK	OK
COMM (POWER/COMM)	OK	OK	OK
NORM	OK	NO	NO
ERR	OK	NO	NO
CNT-TYPE	OK	OK	NO
TAG-TYPE	---	---	---
LV6/7D	OK	NO	NO
LV5/7A	OK	NO	NO
LV4/76	OK	NO	NO
LV3/72	OK	NO	NO
LV2/71	OK	NO	NO
LV1/70	OK	NO	NO

■ Setting Switch



Note: Please attach a setting switch protection cover after setting switch.

Setting	Function	Default setting
SW1-1	Controller selection OFF:V680-CA5D01-V□, CS1W-V680C11, or CJ1W-V680C11 ON: V680-CA1D/-CA2D See Note.	OFF
SW1-2	RF Tag selection OFF:V680-D1KP□□ (EEPEOM RF Tags) ON: V680-D□KF□□ (FRAM RF Tags)	OFF
SW1-3	Reserved by System (Always set this Switch to OFF.)	---
SW1-4	Reserved by System (Always set this Switch to OFF.)	---

Note: Only when the V680-D1KP58HTN is used, it is possible to connect it with the V680-CA1D/-CA2D.
When the V680-CA5D01-V□, CS1W-V680-C11 and CJ1W-V680C11 is used, set SW1-1 of the antenna to turning off.

Set SW1-1 on the V680-H01-V2 Antenna and the Controller as shown in the following table.
When the V680-CA1D/-CA2D is used, set SW1-1 of the antenna to turning on.
When using it excluding the V680-CA1D/-CA2D, set SW1-1 of the antenna to turning off besides.

Antenna setting	Controller setting		
V680-H01-V2	V680-CA5D01-V@	CS1W-V680C11 CJ1W-V680C11	V680-CA1D V680-CA2D
SW1-1: OFF	SW4-8: OFF	DM20000 + 100 × m+3=0000	×
SW1-1: ON	SW4-8: ON See Note.	DM20000 + 100 × m+3=0001 See Note.	○ Â@See Note.

× : Cannot be used.
○ : Can be used.(Controller setting not required.)

Note: The high-speed mode cannot be used by the controller's setting.

CHECK!

Differences between the V680-H01 and the V680-H01-V2

As shown in the following table, the V680-H01-V2 supports additional maintenance functions.
Turn ON SW1-1(Antenna) when using the V680-CA1D/CA2D.
Only when the V680-D1KP58HTN is used, it is possible to set it.

display functions	V680-H01-V2		V680-H01
	SW1-1: OFF	SW1-1: ON	no switch
Communication Test Mode	OK	OK	OK
Noise Level Measurement Mode	OK	NO	NO
Distance Level Measurement Mode	OK	NO	NO
Speed Level Measurement Mode	OK	NO	NO
Communications Success Rate Measurement Mode	OK	NO	NO

Cables (V680-H01-V2 exclusive use)

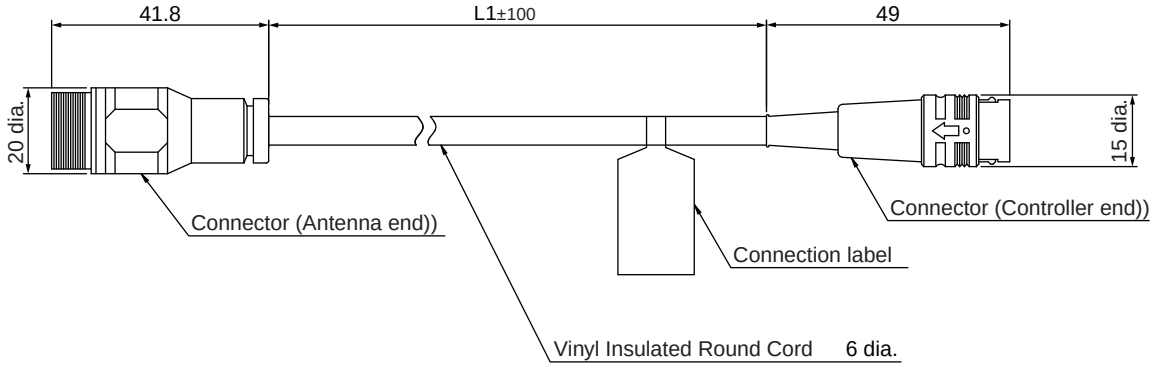
■ Specifications

Item / Model	V700-A40-W
Number of conductors	10
Insulation resistance	5 MΩ min. (at 500 VDC) between terminals and sheath
Dielectric strength	500 VAC, 1 min

■ Dimensions

Item / Model	V700-A40-W 2M	V700-A40-W 5M	V700-A40-W 10M	V700-A40-W 20M	V700-A40-W 30M
Length (L1)	Approx.2m	Approx. 5 m	Approx.10m	Approx. 20 m	Approx. 30 m
Weight	Approx. 150 g	Approx.360 g	Approx. 700 g	Approx.1,350 g	Approx.2,000 g
L1	2,000	5,000	10,000	20,000	30,000

(Unit: mm)



Cable	PVC

Amplifier

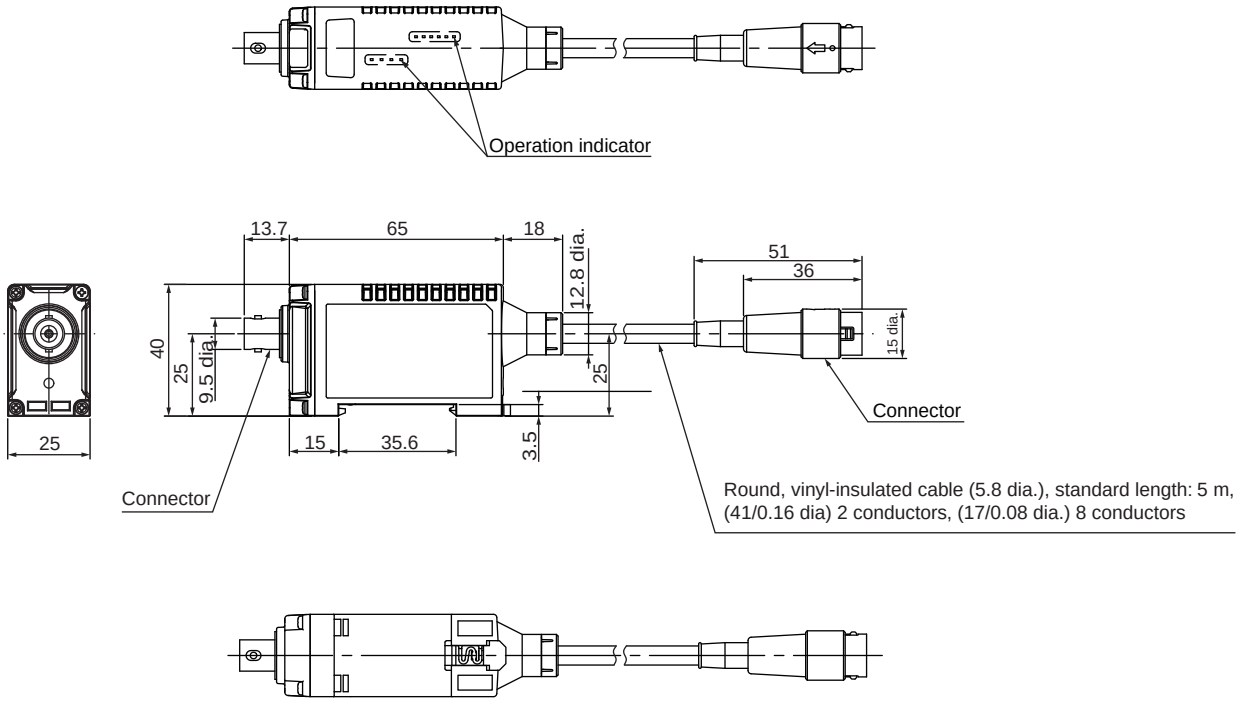
V680-HA63A

■ General Specifications

Item / Model	V680-HA63A	
Ambient operating temperature	-10 to 55°C (with no icing)	
Ambient storage temperature	-25 to 65°C (with no icing)	
Ambient operating humidity	35% to 85% (with no condensation)	
Insulation resistance	20 MΩ min. (at 500 VDC) between cable terminals and case	
Dielectric strength	1,000 VAC, 50/60 Hz for 1 minute between cable terminals and case.	
Degree of protection	IP67, IP65 (IEC 60529) **Note:** Not including connector at Controller end. (When V680-HS52-W, V680-HS63-W, and V680-HS65-W is connected)	IP40 (IEC 60529) (When V680-HS51, V680-HS52-R, V680-HS63-R, and V680-HS65-R is connected)
Dielectric strength	10 to 500 Hz, 1.5-mm double amplitude, acceleration:100 m/s², 10 sweeps in each of 3 axis directions (up/down, left/right, and forward/backward) for 11 minutes each	
Shock resistance	500 m/s², 3 times each in 6 directions (Total: 18 times)	
Dimensions	25 × 40 × 65 mm (Not including protrusions.)	
Materials	PC	
Weight	Approx. 650 g (with 10 m cable)	
Cable length	Standard lengths of 5 and 10 m	

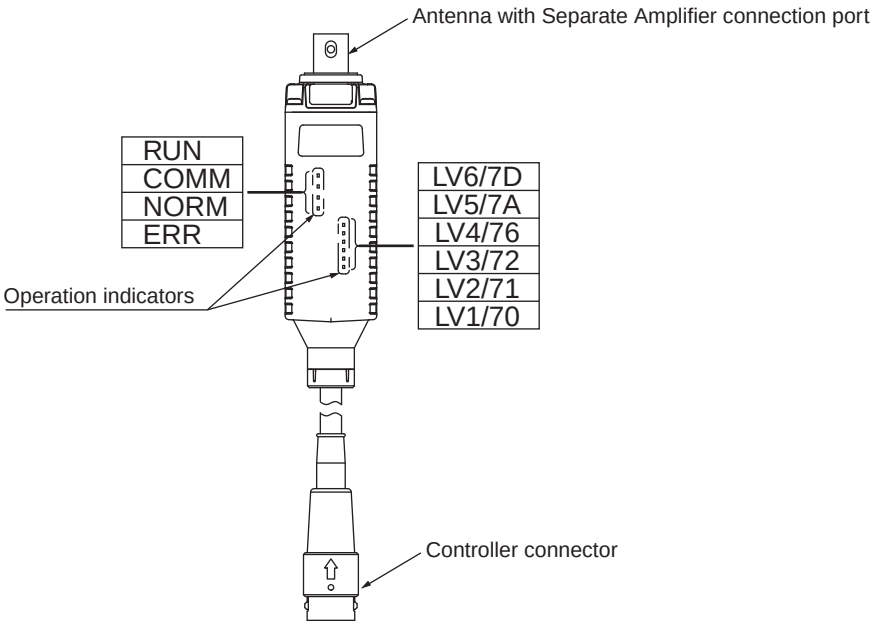
Note: The maximum total cable extension is 50 m (including the Amplifier cable). A maximum of two extension cables can be connected.

■ Dimensions



Case material	PC resin
Cable	PVC

Nomenclature



■ Antenna Connection Port

The Antenna connection port is connected a V680-series Antenna.

■ Controller Connector

The Controller connector is connected to Antenna connection port on the Controller.

■ Operation Indicators (LEDs)

Name	Color	Meaning
RUN	Green	Lit when the power is ON.
COMM	Yellow	Lit when a command is being sent.
NORM	Green	Lit when communications with a RF Tag are normal in Normal Communications Mode.
ERR	Red	Lit when an error occurs in communications with a RF Tag in Normal Communications Mode.
LV6/7D	Yellow	Maintenance Mode: Lit at distance or speed level 6. Normal Communications Mode: Lit when a write protection error occurs.
LV5/7A	Yellow	Maintenance Mode: Lit at distance or speed level 5 or higher. Normal Communications Mode: Lit when an address error occurs.
LV4/76	Yellow	Maintenance Mode: Lit at distance or speed level 4 or higher. Normal Communications Mode: Lit when a RF Tag memory error occurs.
LV3/72	Yellow	Maintenance Mode: Lit at distance or speed level 3 or higher. Normal Communications Mode: Lit when a no RF Tag error occurs.
LV2/71	Yellow	Maintenance Mode: Lit at distance or speed level 2 or higher. Normal Communications Mode: Lit when a verification error occurs.
LV1/70	Yellow	Maintenance Mode: Lit at distance or speed level 1 or higher. Normal Communications Mode: Lit when a RF Tag communications error occurs.

CHECK!

The distance level will vary greatly depending on the surrounding environment. The setting position will serve as a guide, but use RUN mode to conduct a sufficient number of tests in the actual operating environment.
Values of distance level 4 or above may not be displayed, but this will not affect the RUN mode performance and does not indicate a malfunction.

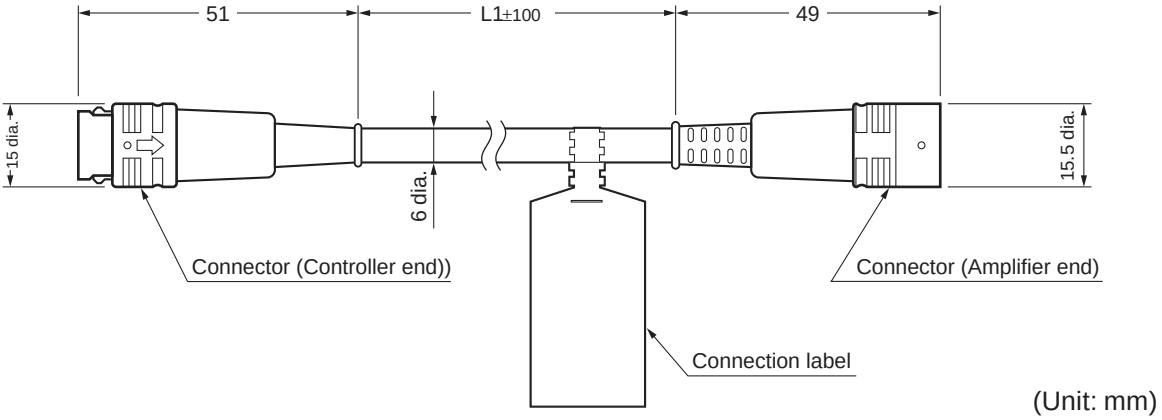
Cables (V680-HA63 exclusive use)

■ Specifications

Item Model	V700-A43/V700-A44
Number of conductors	10
Insulation resistance	5 MΩ min. (at 500 VDC) between terminals and sheath
Dielectric strength	500 VAC, 1 min

■ Dimensions

Item Model	V700-A43	V700-A44
Length (L1)	Approx.10m	Approx. 20 m
Weight	Approx. 700 g	Approx.1,350 g



(Unit: mm)

Cable	PVC

RF Tags

Specifications and Dimensions

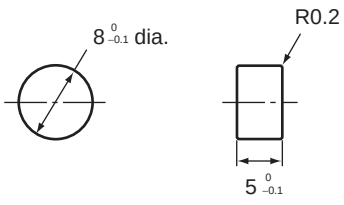
■ V680-D1KP52MT

• General Specifications

Item / Model	V680-D1KP52MT
Memory capacity	1,000 bytes (user area)
Memory type	EEPROM
Data Retention	10 years after writing (85°C or less), 0.5 years after writing (85°C to 125°C) Total data retention at high temperatures exceeding 125°C is 10 hours (See note.)
Write Endurance	100,000 times per block (25°C)
Ambient operating temperature when communicating	-25 to 85°C (with no icing)
Ambient storage temperature (with data retention)	-40 to 125°C (with no icing)
Ambient operating humidity	35% to 95%
Degree of protection	IP68 (IEC 60529) Oil resistance equivalent to IP67g according to the former JEM standard.
Vibration resistance	10 to 2,000 Hz, 1.5-mm double amplitude, acceleration: 150 m/s², 10 sweeps each in X, Y, and Z directions for 15 minutes each
Shock resistance	500 m/s², 3 times each in X, Y, and Z directions (Total: 18 times)
Dimensions	8 dia. × 5 mm
Materials	Case: PPS resin, Filling resin: Epoxy resin
Weight	Approx. 0.5 g
Metal countermeasures	Yes

Note: After string data at high temperatures, rewrite the data even if changes are not required, high temperatures are those exceeding 125°C up to 180°C.

• Dimensions



(Unit : mm)

Case material	PPS resin
Filling resin	Epoxy resin

CHECK! When embedding the V680-D1KP52MT into a metal surface, use the V680-HS51, V680-HS52 Antenna. Transmission will not be possible if the V680-HS63 Antenna is used.

CHECK! The side with the markings is the communications surface. Mount the RF Tag with this side facing the Antenna.

CHECK! The ID code is written in the memory of the RF Tag and may be affected by data retention characteristics at high temperatures. Take suitable precautions when using the READ ID command for RF Tags operating at high temperatures.

• RF Tag Heat Resistivity

- Storing RF Tags under high temperatures or heat cycle will adversely affect the performance of the internal parts and the service life of the RF Tags.
- An LTPD of 10% was determined during the evaluation for RF Tags that reached the end of their life after testing under the following test conditions.

Heat cycle	-10°C/+150°C, 30 minutes each for 1,000 cycles: Defective number 0/22 piece
	-100°C/+180°C,30 minutes each for 200 cycles: Defective number 0/22 piece
High temperatures	+150°C, 1,000 hours: Defective number 0/22 piece
	+180°C, 200 hours: Defective number 0/22 piece

LTPD: Lot tolerance percent defective
The lower limit of the malfunction rate for lots to be considered unacceptable during reliability testing.

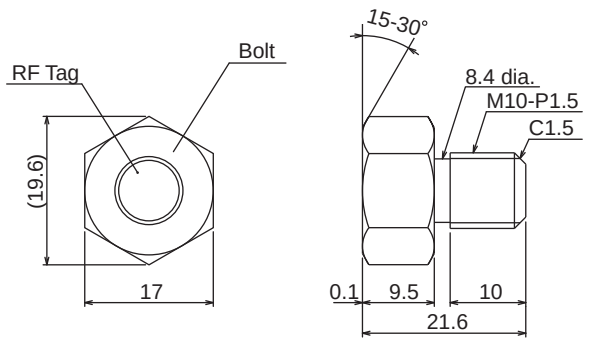
■ V680-D1KP52M-BT01

• General Specifications

Item / Model	V680-D1KP52M-BT01
Memory capacity	1,000 bytes (user area)
Memory type	EEPROM
Data Retention	10 years after writing (85°C or less), 0.5 years after writing (85°C to 125°C) Total data retention at high temperatures exceeding 125°C is 10 hours (See note.)
Write Endurance	100,000 times per block (25°C)
Ambient operating temperature when communicating	-25 to 85°C (with no icing)
Ambient storage temperature (with data retention)	-40 to 125°C (with no icing)
Ambient operating humidity	35% to 95%
Degree of protection	IP68 (IEC 60529) Oil resistance equivalent to IP67g according to the former JEM standard.
Vibration resistance	10 to 2,000 Hz, 1.5-mm double amplitude, acceleration: 150 m/s^2, 10 sweeps each in X, Y, and Z directions for 15 minutes each
Shock resistance	500 m/s^2, 3 times each in X, Y, and Z directions (Total: 18 times)
Dimensions	Hex Head: 17HEX × 9.5 mm, Screw: M10 × 10 mm
Materials	Bolt: SUS303, Case(RF Tag): PPS resin, Filling resin(RF Tag): Epoxy resin
Weight	Approx. 25 g
Metal countermeasures	Yes

• Dimensions

(Unit: mm)



Bolt material	SUS303
Case material (RF Tag)	PPS resin
Filling resin (RF Tag)	Epoxy resin

CHECK! The side with the markings is the communications surface. Mount the RF Tag with this side facing the Antenna.

CHECK! The ID code is written in the memory of the RF Tag and may be affected by data retention characteristics at high temperatures. Take suitable precautions when using the READ ID command for RF Tags operating at high temperatures.

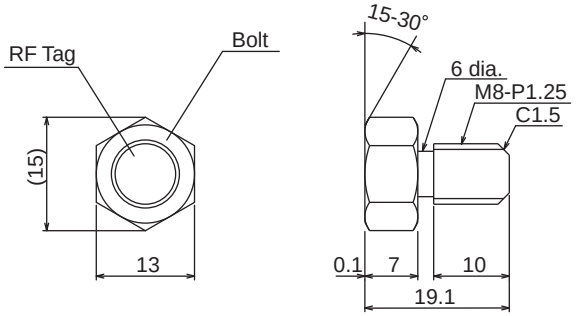
■ V680-D1KP52M-BT11

• General Specifications

Item / Model	V680-D1KP52M-BT11
Memory capacity	1,000 bytes (user area)
Memory type	EEPROM
Data Retention	10 years after writing (85°C or less), 0.5 years after writing (85°C to 125°C) Total data retention at high temperatures exceeding 125°C is 10 hours (See note.)
Write Endurance	100,000 times per block (25°C)
Ambient operating temperature when communicating	-25 to 85°C (with no icing)
Ambient storage temperature (with data retention)	-40 to 125°C (with no icing)
Ambient operating humidity	35% to 95%
Degree of protection	IP68 (IEC 60529) Oil resistance equivalent to IP67g according to the former JEM standard.
Vibration resistance	10 to 2,000 Hz, 1.5-mm double amplitude, acceleration: 150 m/s², 10 sweeps each in X, Y, and Z directions for 15 minutes each
Shock resistance	500 m/s², 3 times each in X, Y, and Z directions (Total: 18 times)
Dimensions	Hex Head: 13HEX × 7 mm, Screw: M8 × 10 mm
Materials	Bolt: SUS303, Case(RF Tag): PPS resin, Filling resin(RF Tag): Epoxy resin
Weight	Approx. 10 g
Metal countermeasures	Yes

• Dimensions

(Unit: mm)



Bolt material	SUS303
Case material (RF Tag)	PPS resin
Filling resin (RF Tag)	Epoxy resin

CHECK! The side with the markings is the communications surface. Mount the RF Tag with this side facing the Antenna.

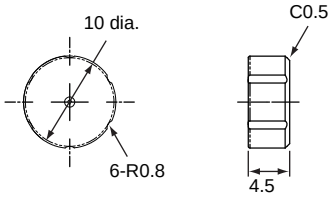
CHECK! The ID code is written in the memory of the RF Tag and may be affected by data retention characteristics at high temperatures. Take suitable precautions when using the READ ID command for RF Tags operating at high temperatures.

■ V680-D1KP53M

▪ General Specifications

Item / Model	V680-D1KP53M
Memory capacity	1,000 bytes (user area)
Memory type	EEPROM
Data Retention	10 years after writing (85°C or less), 0.5 years after writing (85 to 125°C)
Write Endurance	100,000 times per block (25°C)
Ambient operating temperature when communicating	−25 to 85°C (with no icing)
Ambient storage temperature (with data retention)	−40 to 125°C (with no icing)
Ambient operating humidity	35% to 95%
Degree of protection	IP68 (IEC 60529) Oil resistance equivalent to IP67g according to the former JEM standard.
Vibration resistance	10 to 2,000 Hz, 1.5-mm double amplitude, acceleration: 150 m/s^2, 10 sweeps each in X, Y, and Z directions for 15 minutes each
Shock resistance	500 m/s^2, 3 times each in X, Y, and Z directions (Total: 18 times)
Dimensions	10 dia. × 4.5 mm (DIN698373)
Materials	Case: PPS resin, Filling resin: Epoxy resin
Weight	Approx. 1.0 g
Metal countermeasures	Yes

▪ Dimensions



Case material	PPS resin
Filling resin	Epoxy resin

CHECK! When embedding the V680-D1KP53M into a metal surface, use the V680-HS51, V680-HS52 Antenna. Transmission will not be possible if the V680-HS63 Antenna is used.

CHECK! The side with the markings is the communications surface. Mount the RF Tag with this side facing the Antenna.

■ V680-D1KP54T

• General Specifications

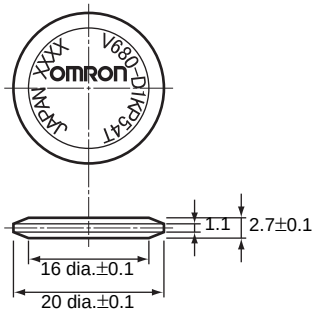
Item / Model	V680-D1KP52MT
Memory capacity	1,000 bytes (user area)
Memory type	EEPROM
Data Retention	10 years after writing (85°C or less), 0.5 years after writing (85°C to 125°C) Total data retention at high temperatures exceeding 125°C is 10 hours (See note.)
Write Endurance	100,000 times per block (25°C)
Ambient operating temperature when communicating	-25 to 85°C (with no icing)
Ambient storage temperature (with data retention)	-40 to 125°C (with no icing)
Ambient operating humidity	35% to 95%
Degree of protection	IP67 (IEC 60529) Oil resistance equivalent to IP67g according to the former JEM standard.
Vibration resistance	10 to 2,000 Hz, 1.5-mm double amplitude, acceleration: 150 m/s², 10 sweeps each in X, Y, and Z directions for 15 minutes each
Shock resistance	500 m/s², 3 times each in X, Y, and Z directions (Total: 18 times)
Dimensions	20 dia. × 2.7 mm
Materials	PPS resin
Weight	Approx. 2.0 g
Metal countermeasures	None

Note: After string data at high temperatures, rewrite the data even if changes are not required, high temperatures are those exceeding 125°C up to 180°C.

▪ Dimensions

V680-D1KP54T

(Unit : mm)

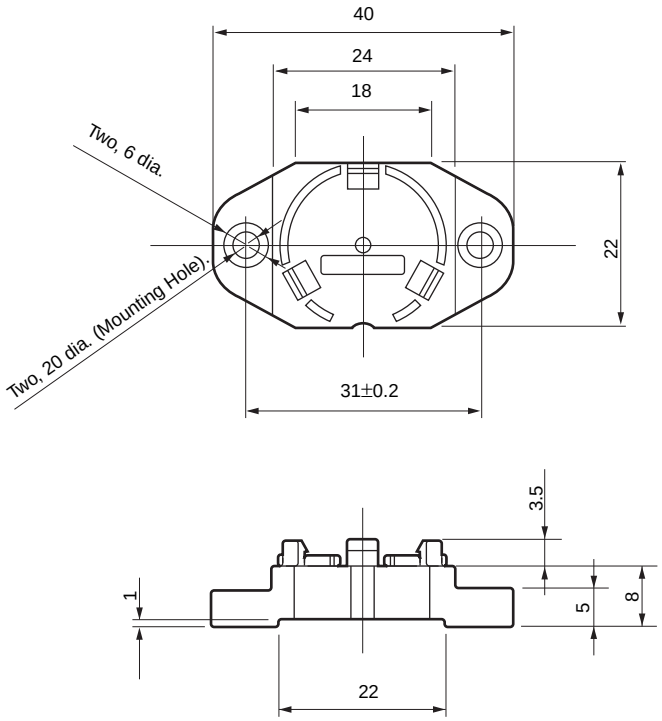


Case material	PPS resin

CHECK! The coin-shaped RF Tag has no directionality, so it can be faced in any direction.

CHECK! The ID code is written in the memory of the RF Tag and may be affected by data retention characteristics at high temperatures. Take suitable precautions when using the READ ID command for RF Tags operating at high temperatures.

V600-A86 Attachment



(Unit : mm)

Material	PPS resin

• RF Tag Heat Resistivity

- Storing RF Tags under high temperatures or heat cycle will adversely affect the performance of the internal parts and the service life of the RF Tags.
- An LTPD of 10% was determined during the evaluation for RF Tags that reached the end of their life after testing under the following test conditions.

Heat cycle	-10°C/+150°C, 30 minutes each for 1,000 cycles: Defective number 0/22 piece
	-100°C/+180°C,30 minutes each for 200 cycles: Defective number 0/22 piece
High temperatures	+150°C, 1,000 hours: Defective number 0/22 piece
	+180°C, 200 hours: Defective number 0/22 piece

CHECK!

LTPD: Lot tolerance percent defective
The lower limit of the malfunction rate for lots to be considered unacceptable during reliability testing.

■ V680-D1KP66T/66MT

• General Specifications

Item / Model	V680-D1KP66T	V680-D1KP66MT
Memory capacity	1,000 bytes (user area)	
Memory type	EEPROM	
Data Retention	10 years after writing (85°C or less), 0.5 years after writing (85°C to 125°C) Total data retention at high temperatures exceeding 125°C is 10 hours (See note.)	
Write Endurance	100,000 times per block (25°C)	
Ambient operating temperature	-25 to 85°C (with no icing)	
Ambient storage temperature	-40 to 125°C (with no icing)	
Ambient operating humidity	35% to 95%	
Degree of protection	IP68 (IEC 60529) Oil resistance equivalent to IP67g according to the former JEM standard.	
Vibration resistance	10 to 2,000 Hz, 1.5-mm double amplitude, acceleration: 150 m/s^2,10 sweeps each in X, Y, and Z directions for 15 minutes each	
Shock resistance	500 m/s^2, 3 times each in X, Y, and Z directions (Total: 18 times)	
Dimensions	34 × 34 × 3.5 mm	
Materials	Case: PPS resin	
Weight	Approx. 6 g	Approx. 7.5 g
Metal countermeasures	None	Yes

Note: After string data at high temperatures, rewrite the data even if changes are not required, high temperatures are those exceeding 125°C up to 180°C.

The V680-D1KP66MT is designed to be mounted directly to metal. The V680-D1KP66T and V680-D1KP66MT markings are shown in the following diagrams.

●V680-D1KP66MT

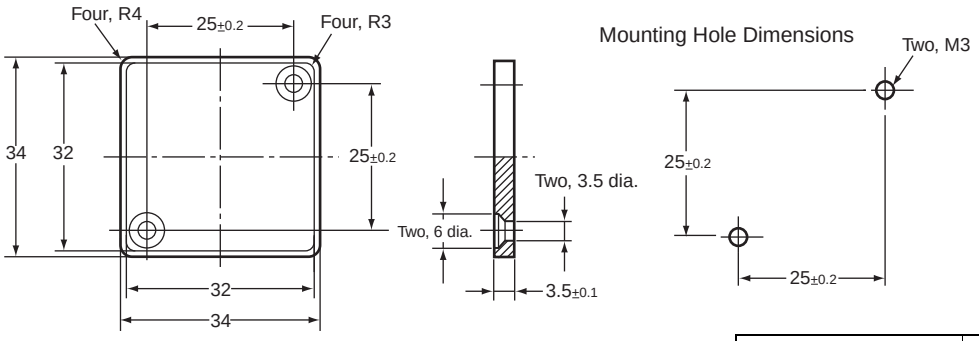
●V680-D1KP66T

CHECK! The side with the markings is the communications surface. Mount the RF Tag with this side facing the Antenna.

CHECK! The ID code is written in the memory of the RF Tag and may be affected by data retention characteristics at high temperatures. Take suitable precautions when using the READ ID command for RF Tags operating at high temperatures.

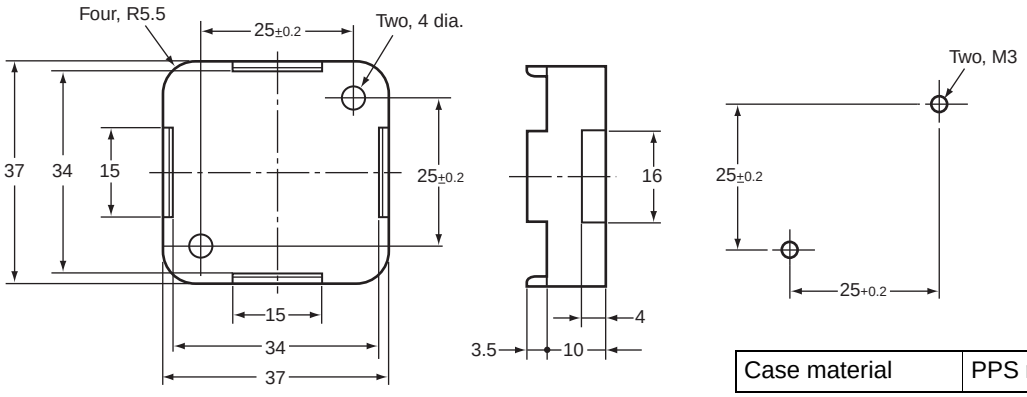
• Dimensions

V680-D1KP66T/66MT



Case material	PPS resin

V600-A86 Attachment



Case material	PPS resin

• RF Tag Heat Resistivity

- Storing RF Tags under high temperatures or heat cycle will adversely affect the performance of the internal parts and the service life of the RF Tags.
- An LTPD of 10% was determined during the evaluation for RF Tags that reached the end of their life after testing under the following test conditions.

Heat cycle	-10°C/+150°C, 30 minutes each for 1,000 cycles: Defective number 0/22 piece
	-100°C/+180°C,30 minutes each for 200 cycles: Defective number 0/22 piece
High temperatures	+150°C, 1,000 hours: Defective number 0/22 piece
	+180°C, 200 hours: Defective number 0/22 piece

CHECK!

LTPD: Lot tolerance percent defective
The lower limit of the malfunction rate for lots to be considered unacceptable during reliability testing.

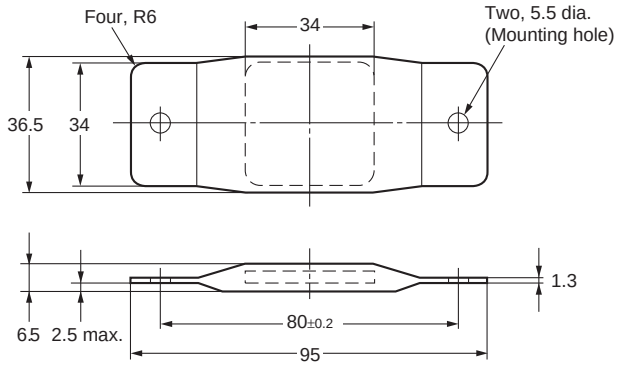
■ V680-D1KP66T-SP

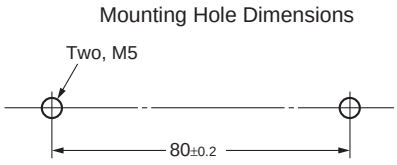
• General Specifications

Item / Model	V680-D1KP66T-SP
Memory capacity	1,000 bytes (user area)
Memory type	EEPROM
Data Retention	10 years after writing (85°C or less)
Write Endurance	100,000 times per block (25°C)
Ambient operating temperature when communicating	-25 to 70°C (with no icing)
Ambient operating temperature when not communicating	-40 to110°C (with no icing)
Ambient storage temperature	-40 to 110°C (with no icing)
Ambient operating humidity	35% to 95%
Degree of protection	IP67
Vibration resistance	10 to 2,000 Hz, 1.5-mm double amplitude, acceleration: 150 m/s^2,10 sweeps each in X, Y, and Z directions for 15 minutes each
Shock resistance	500 m/s^2, 3 times each in X, Y, and Z directions (Total: 18 times)
Dimensions	95 × 36.5 × 6.5 mm (excluding protruding parts)
Materials	External coatiog: Fluororesin (PFA) RF Tag body: PPS resin
Weight	Approx. 20 g
Mounting method	Two M5 screws
Metal countermeasures	None

• Dimensions

(Unit: mm)





Case material	PFA resin

CHECK!

The side with the markings is the communications surface. Mount the RF Tag with this side facing the Antenna.

■ V680-D1KP58HTN

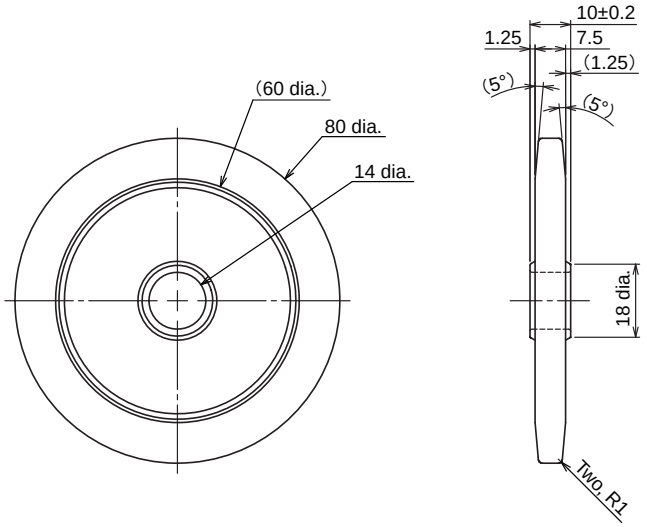
• General Specifications

Item / Model	V680-D1KP58HTN
Memory capacity	1,000 bytes (user area)
Memory type	EEPROM
Data Retention	10 years after writing (85°C or less), 0.5 years after writing (85°C to 125°C) Total data retention at high temperatures exceeding 125°C is 10 hours
Write Endurance	100,000 times per block (25°C)
Ambient operating temperature	-25 to 85°C (with no icing)
Ambient storage temperature	-40 to 250°C (with no icing) (Data retention: -40 to 125°C)
Ambient operating humidity	35% to 95%
Degree of protection	IP67 (IEC 60529) Oil resistance equivalent to IP67g according to the former JEM standard.
Vibration resistance	10 to 2,000 Hz, 1.5-mm double amplitude, acceleration: 150 m/s^2,10 sweeps each in X, Y, and Z directions for 15 minutes each
Shock resistance	500 m/s^2, 3 times each in X, Y, and Z directions (Total: 18 times)
Materials	Coatiog: PPS resin
Weight	Approx. 70 g

• Dimensions

V680-D1KP58HTN

(Unit: mm)



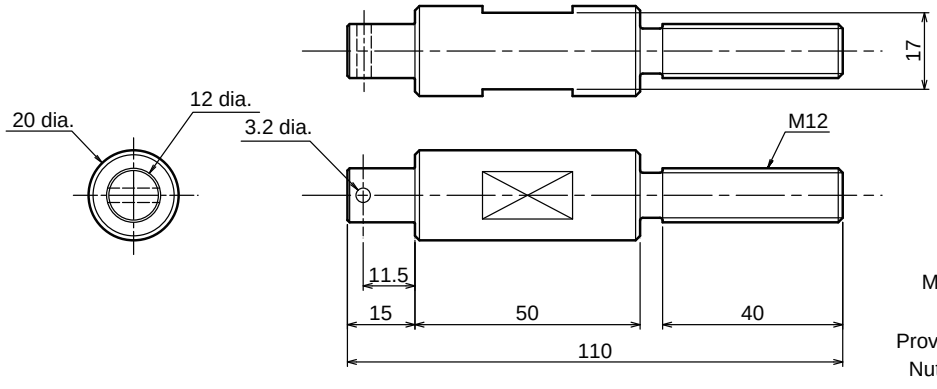
Case material	PPS resin

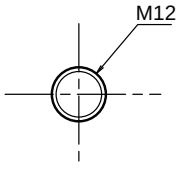
V680-A80 (Attachment)

This Attachment is specifically designed to secure V680-D1KP58HTN RF Tags to the workpiece.

Applicable RF Tag model: V680-D1KP58HTN

(Unit: mm)





Mounting Hole Dimensions

Provided Parts
Nuts (M12): 2
Split pin (3.2 × 20 mm): 1

Use at high temperatures (V680-D1KP58HTN)

■ Data retention

- Data stored in memory in the RF Tag may be lost due to the characteristics of EEPROM, if the accumulated usage time of the RF Tag at a high temperature over 125°C exceeds 10 hours after writing data to the RF Tag. Reset the data retention time before the accumulated usage time exceeds 10 hours.
- An error in communications between the Antenna and the RF Tag may occur in an environment where the ambient operating temperature is 85°C or higher. Do not communicate between the Antenna and the RF Tag in an environment where the ambient operating temperature is 85°C or higher.
- The UID (unique identification number for each RF Tag) may be lost due to the characteristics of EEPROM when the RF tag is used at a high temperature over 125°C. Do not use the commands using UID at a high temperature over 125°C.
  - •Do not use the READ ID command (command code: ID).
  - •Do not make the UID Addition Setting (command code: US).
  - •Communications specifications (FIFO trigger, FIFO repeat, multi-access trigger, multi-access repeat, and selective) can not be used.

• Accumulated time

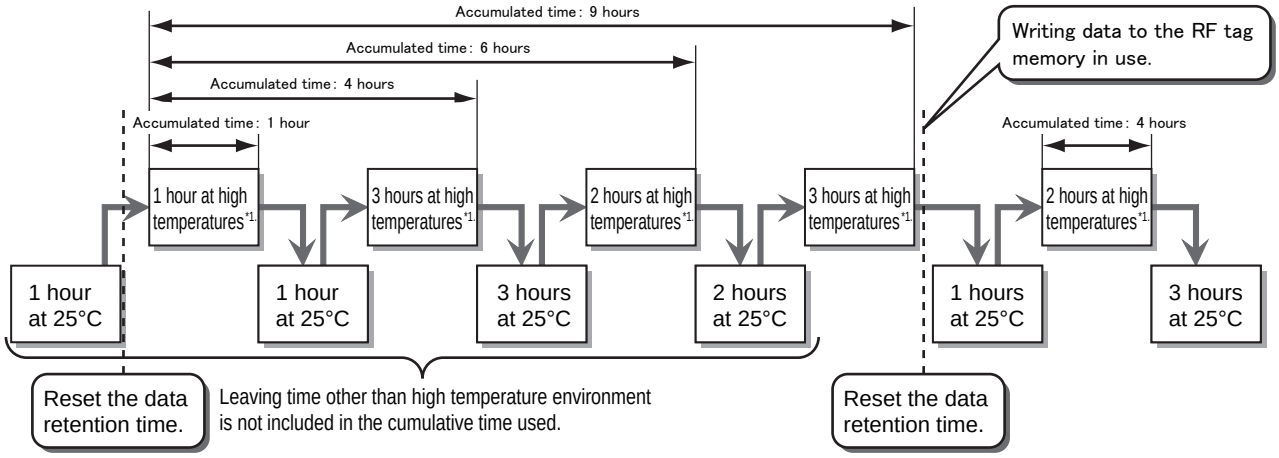


Fig. Concept of resetting the data retention time

*1. High temperatures are those exceeding 125°C up to 250°C.

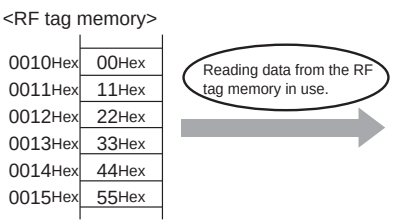
• Resetting the data retention time

<When using the RF Tag addresses 0010Hex to 0015Hex.>

1.Reading data from the RF tag addresses 0010Hex to 0015Hex.

Command : RDSTH100100006[CR]*

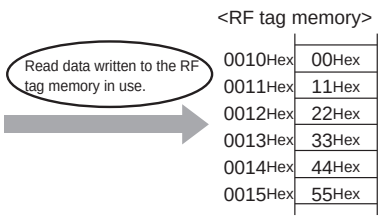
Reseponse : RD0010001122334455[CR]*



2.Read data written to the RF tag addresses 0010Hex to 0015Hex..

Command : WTSTH10010001122334455[CR]*

Reseponse : WT0010[CR]*



CHECK!

Data retention is reset only data written to the RF tag address.
If you reset the data retention, writes the same data to all of the tag memory in use.

■ Heat Resistance

Storing RF Tags under high temperatures or heat cycle will adversely affect the performance of the internal parts and the service life of the RF Tags.

Correct operation has been confirmed through the OMRON in-house evaluation for RF Tags under the following high-temperature conditions.

1) 2,000 cycles, where 1 cycle is each 30-minute at Room temperature and 200°C

2) 250°C, 500 hours

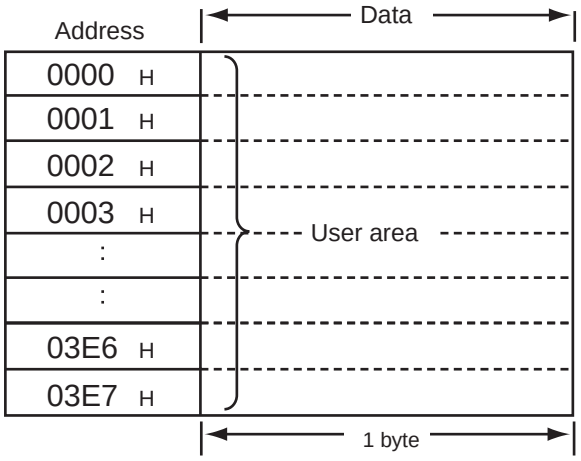
■ The controller's setting

Please set the latest ID controller to the CA1D mode and use it when the latest ID controller is used together with the old model ID controller Model V680-CA1D/-CA2D.

RF Tag / Controller	V680-D1KP58HT only	V680-D1KP58HT and V680-D1KP58HTN used together	V680-D1KP58HTN only
V680-CA1D/-CA2D only	Not required	Not required	Not required
C680-CA1D/-CA2D and the latest ID controller used together	Not required	Set the latest ID controller to the CA1D mode.	Set the latest ID controller to the CA1D mode.
The latest ID controller only	Not required	Not required	Not required

Note: The latest ID controller:
V680-CA5D01-V2/-CA5D02-V2
V680-CH1D/CHUD/-CH1D-PSI
CS1W-V680C11/-V680C12
CJ1W-V680C11/-V680C12

Memory Map



EEPROM is used as memory in the RF Tags.
The memory capacity available to the user is 1,000 bytes, including 0000H to 0003H (the Write Protection Setting Area).

CHECK!

The access to the memory is executed at every block.
1 block is 8 bytes (8 addresses).

CHECK!

The communication between RF Tag and the antenna of the V680 series is a block unit (8bytes).
There is a possibility to which data is mistaken with the block unit when the writing error occurs.

Write Protection Function

The write protection function prevents important data, such as product information, stored in memory in a RF Tag from being inadvertently overwritten.

After important data has been written to memory, it can be write-protected using the following method.

CHECK!

The write protection function can be switched with SW4-7 (Write Protection Function Setting) of the V680-CA5D□□-V□ Controller or with word (Write Protection Function Setting) in the DM(m+2)CH Area words allocated to the C□1W-V680C□□ ID Sensor Unit.

CHECK!

Refer to the *V680 Series User's Manual* (Cat. No. Z249) for details.

■ Setting the Write Protection Function

Write protection is set in RF Tag addresses 0000H to 0003H.

The setting for the most significant bit of address 0000H specifies whether or not write protection is enabled.

Address / Bit	7	6	5	4	3	2	1	0
0000H	YES/ NO	Upper two digits of start address (00H to 7FH)						
0001H	Lower two digits of start address (00H to FFH)							
0002H	Upper two digits of end address (00H to FFH)							
0003H	Lower two digits of end address (00H to FFH)							

- **Write-protect Bit (Most significant bit of address 0000H)**

  1: Write-protected (Yes)

  0: Not write-protected (No)

- **Write Protection Setting Area**

  Start address: 0000H to 7FFFH

  End address: 0000H to FFFFH

■ Write Protection Setting Examples

• Settings to write-protect addresses 0008H through 03E7H:

Address	Bit	7	6	5	4	3	2	1	0
0000H		1	0	0	0	0	0	0	0
		8				0			
0001H		0	0	0	0	1	0	0	0
		0				8			
0002H		0	0	0	0	0	0	1	1
		0				3			
0003H		1	1	1	0	0	1	1	1
		E				7			

• Settings to not write-protect any addresses:

Address	Bit	7	6	5	4	3	2	1	0
0000H		0	0	0	0	0	0	0	0
		0				0			
0001H		0	0	0	0	0	0	0	0
		0				0			
0002H		0	0	0	0	0	0	0	0
		0				0			
0003H		0	0	0	0	0	0	0	0
		0				0			

CHECK!

The write protection function is a function of the V680-CA5D□□-V□ Controller and the C□1W-V680C□□ ID Sensor Unit. It is not supported by reader/writer units from other manufacturers.

Section 3
Communications Specifications

Communications Distances	46
Communication Time (Reference)	60

Communications Distances

V680-D1KP52MT

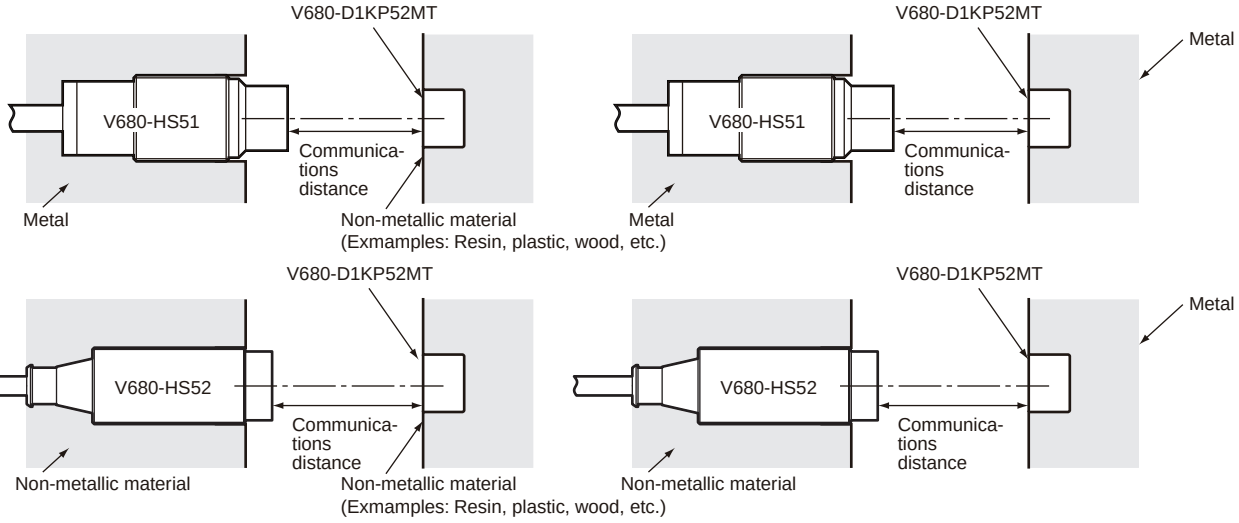
■ Communications Distance Specifications (Guaranteed)

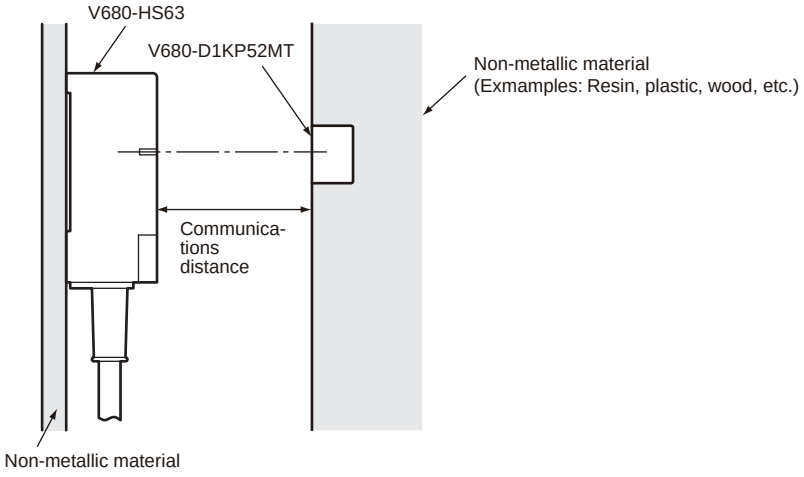
Amplifier	Antenna	RF Tag	Communications distance	
V680-HA63A	V680-HS51	V680-D1KP52MT	Read	0.5 to 6.5 mm (Axis offset: ±2 mm)
			Write	0.5 to 6.0 mm (Axis offset: ±2 mm)
	V680-HS51	V680-D1KP52MT embedded in metal (steel)	Read	0.5 to 3.5 mm (Axis offset: ±2 mm)
			Write	0.5 to 3.0 mm (Axis offset: ±2 mm)
	V680-HS52	V680-D1KP52MT	Read	0 to 9.0 mm (Axis offset: ±2 mm)
			Write	0 to 8.5 mm (Axis offset: ±2 mm)
	V680-HS52	V680-D1KP52MT embedded in metal (steel)	Read	0 to 4.5 mm (Axis offset: ±2 mm)
			Write	0 to 4.0 mm (Axis offset: ±2 mm)
	V680-HS63	V680-D1KP52MT	Read	0 to 12.0 mm (Axis offset: ±2 mm)
			Write	0 to 9.5 mm (Axis offset: ±2 mm)

CHECK!

When embedding the V680-D1KP52MT into a metal surface, use the V680-HS51, V680-HS52 Antenna. Transmission will not be possible if the V680-HS63 Antenna is used.

• Measurement Conditions



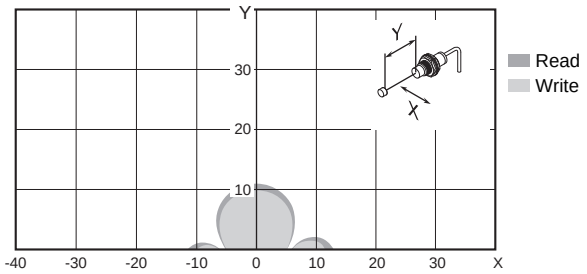


■ Communications Area (Reference)

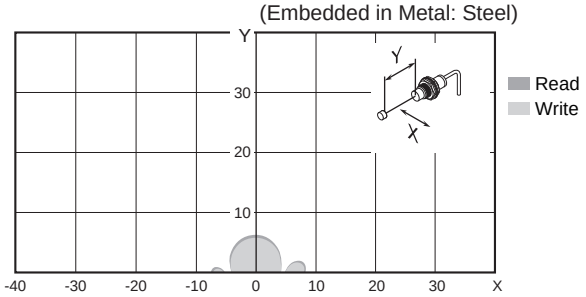
The communications areas given here are for reference only. For information on communications distances, refer to p.46.

The communications area depends on the type of RF Tags used, the ambient temperature, surrounding metals, and noise. Be sure to check carefully when installing the system.

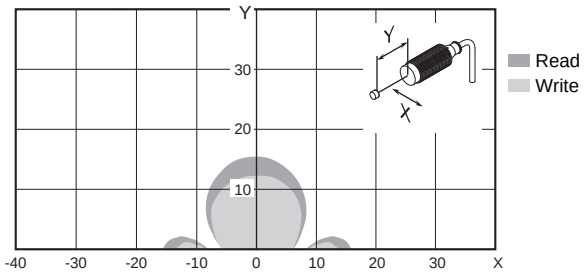
● V680-HS51（Embedded in Metal）and V680-D1KP52MT



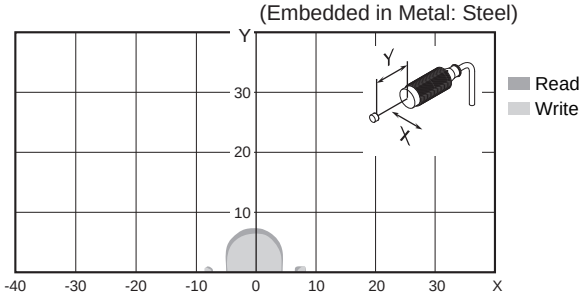
● V680-HS51（Embedded in Metal）and V680-D1KP52MT
(Embedded in Metal: Steel)



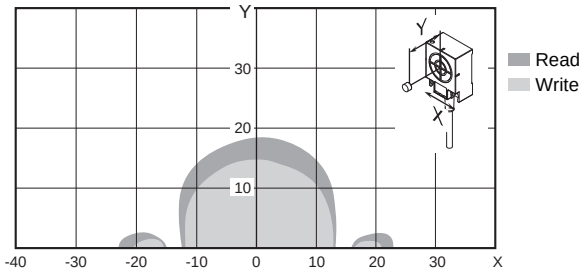
● V680-HS52（Embedded in Non-Metal）and V680-D1KP52MT



● V680-HS52（Embedded in Non-Metal）and V680-D1KP52MT
(Embedded in Metal: Steel)



● V680-HS63（with Non-Metal on Back Surface）and V680-D1KP52MT

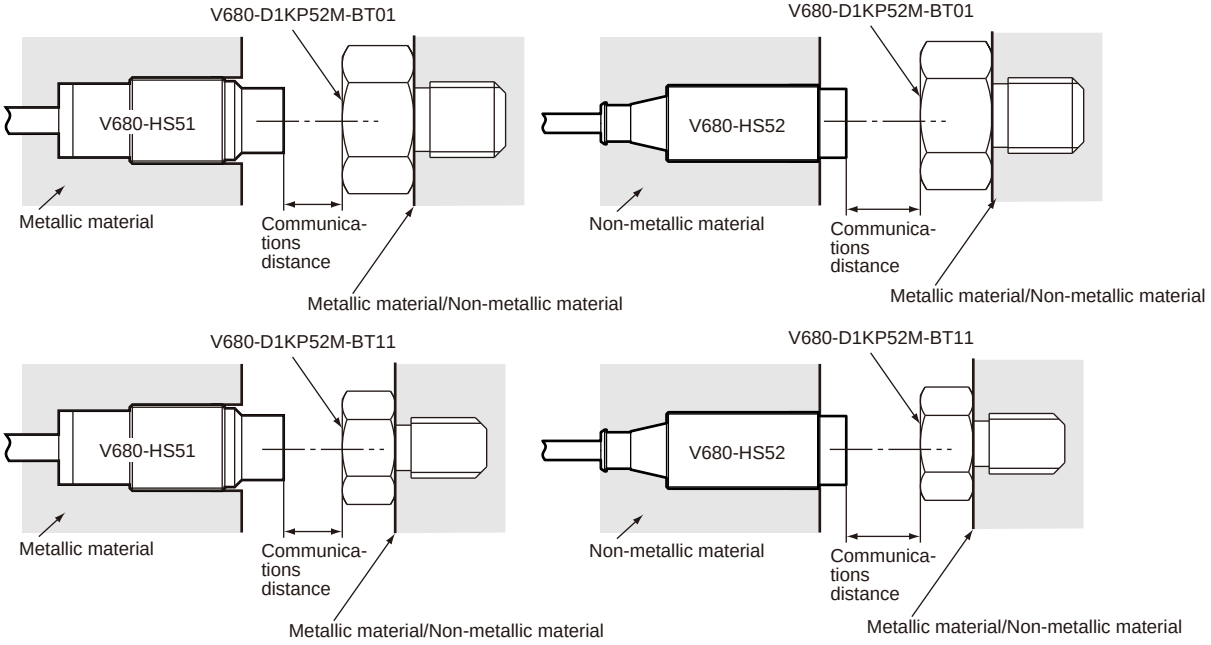


V680-D1KP52M-BT01/-D1KP52M-BT11

■ Communications Distance Specifications (Guaranteed)

Amplifier	Antenna	RF Tag	Communications distance	
V680-HA63A	V680-HS51	V680-D1KP52M-BT01/-D1KP52M-BT11	Read	0.5 to 2.5 mm (Axis offset: ±2 mm)
			Write	0.5 to 2.0 mm (Axis offset: ±2 mm)
	V680-HS52	V680-D1KP52M-BT01/-D1KP52M-BT11	Read	0 to 3.0 mm (Axis offset: ±2 mm)
			Write	0 to 2.5 mm (Axis offset: ±2 mm)

• Measurement Conditions

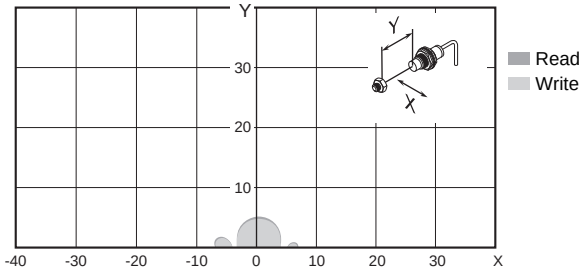


■ Communications Area (Reference)

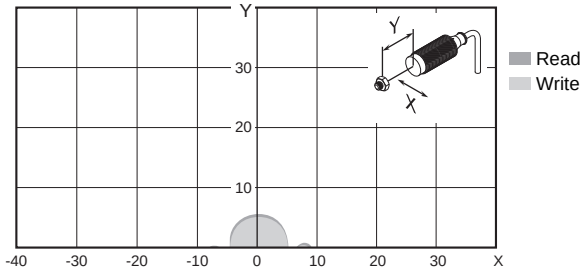
The communications areas given here are for reference only. For information on communications distances, refer to p.46.

The communications area depends on the type of RF Tags used, the ambient temperature, surrounding metals, and noise. Be sure to check carefully when installing the system.

●V680-HS51（Embedded in Metal）
and V680-D1KP52M-BT01/-D1KP52M-BT11



●V680-HS52（Embedded in Non-Metal）
and V680-D1KP52M-BT01/-D1KP52M-BT11



V680-D1KP53M

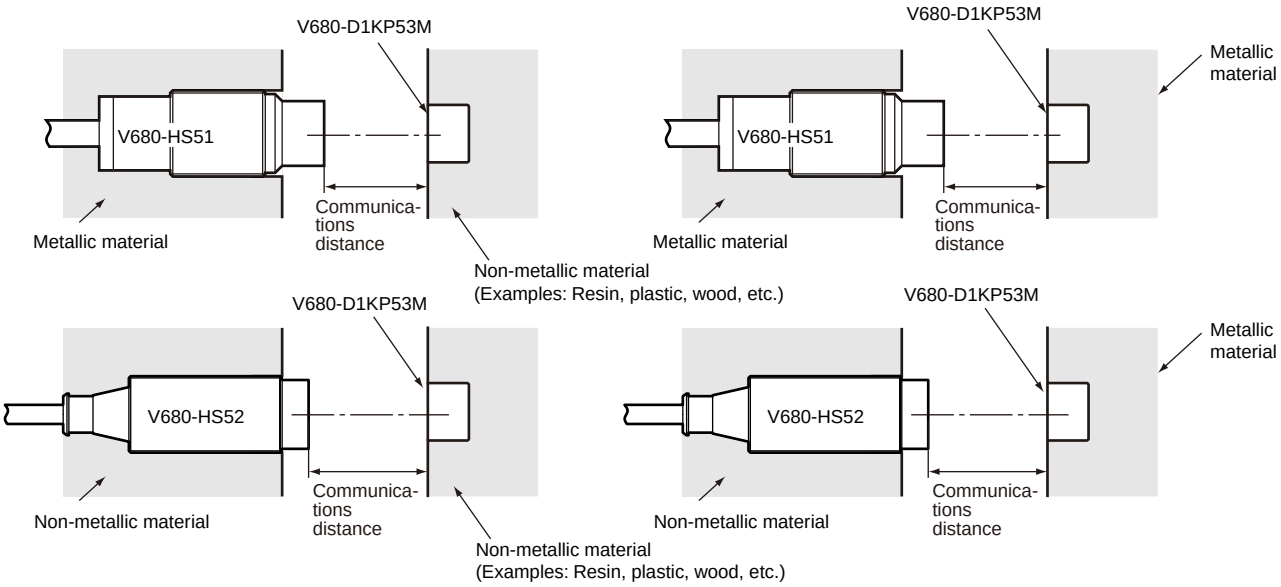
■ Communications Distance Specifications (Guaranteed)

Amplifier	Antenna	RF Tag	Communications distance	
V680-HA63A	V680-HS51	V680-D1KP53M	Read	0.5 to 6.5 mm (Axis offset: ±2)
			Write	0.5 to 6.0 mm (Axis offset: ±2)
		V680-D1KP53M embedded in metal (steel)	Read	0.5 to 3.5 mm (Axis offset: ±2)
			Write	0.5 to 3.0 mm (Axis offset: ±2)
	V680-HS52	V680-D1KP53M	Read	0 to 9.0 mm (Axis offset: ±2 mm)
			Write	0 to 8.5 mm (Axis offset: ±2 mm)
		V680-D1KP53M embedded in metal (steel)	Read	0 to 4.5 mm (Axis offset: ±2 mm)
			Write	0 to 4.0 mm (Axis offset: ±2 mm)

CHECK!

When embedding the V680-D1KP53M into a metal surface, use the V680-HS51/-HS52 Antenna.
Transmission will not be possible if the V680-HS63 Antenna is used.

▪ Measurement Conditions

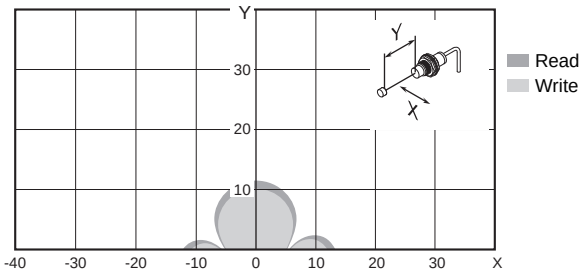


■ Communications Area (Reference)

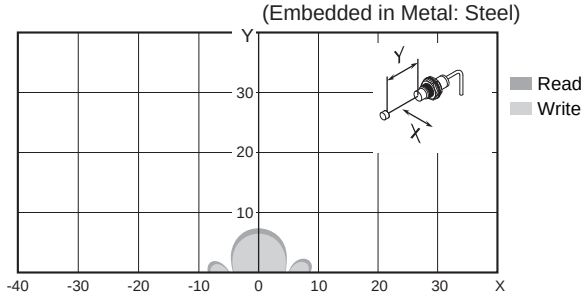
The communications areas given here are for reference only. For information on communications distances, refer to p.49.

The communications area depends on the type of RF Tags used, the ambient temperature, surrounding metals, and noise. Be sure to check carefully when installing the system.

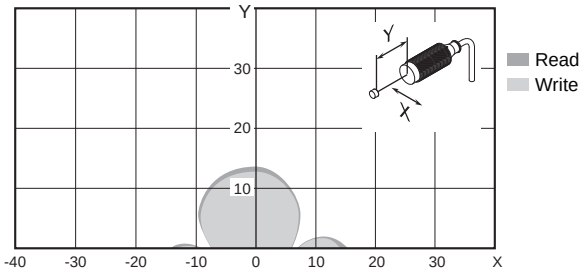
● V680-HS51（Embedded in Metal）and V680-D1KP53M



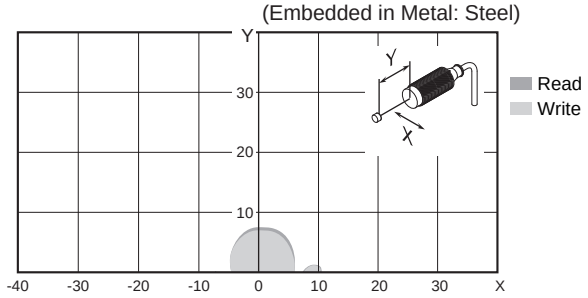
● V680-HS51（Embedded in Metal）and V680-D1KP53M
(Embedded in Metal: Steel)



● V680-HS52（Embedded in Non-Metal）and V680-D1KP53M



● V680-HS52（Embedded in Non-Metal）and V680-D1KP53M
(Embedded in Metal: Steel)

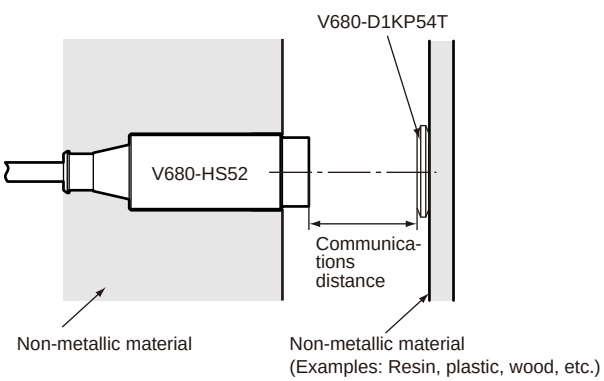


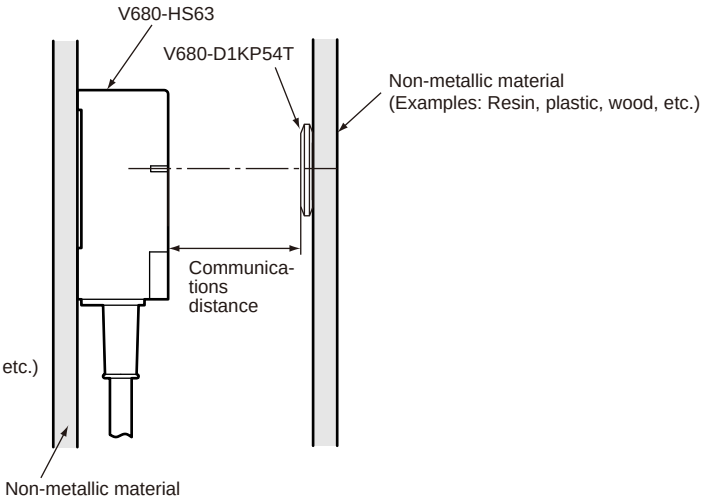
V680-D1KP54T

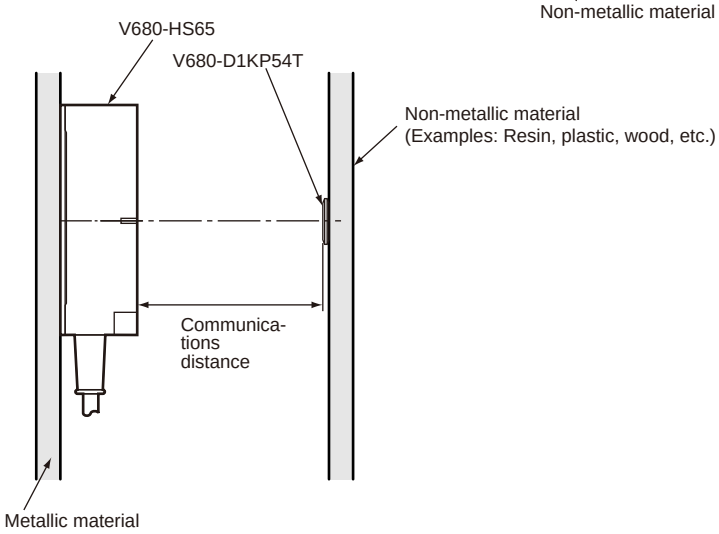
■ Communications Distance Specifications (Guaranteed)

Amplifier	Antenna	RF Tag	Communications distance	
V680-HA63A	V680-HS52	V680-D1KP54T	Read	0 to 17.0 mm (Axis offset: ±2 mm)
			Write	0 to 15.0 mm (Axis offset: ±2 mm)
	V680-HS63	V680-D1KP54T	Read	0 to 24.0 mm (Axis offset: ±10 mm)
			Write	0 to 20.0 mm (Axis offset: ±10 mm)
	V680-HS65	V680-D1KP54T	Read	0 to 33.0 mm (Axis offset: ±10 mm)
			Write	0 to 28.0 mm (Axis offset: ±10 mm)

• Measurement Conditions





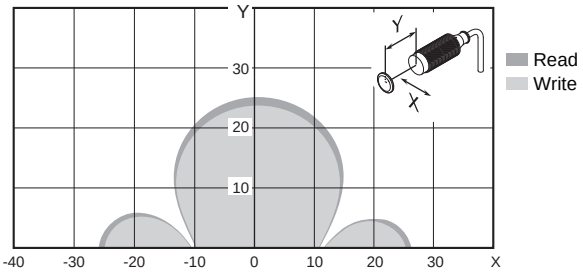


■ Communications Area (Reference)

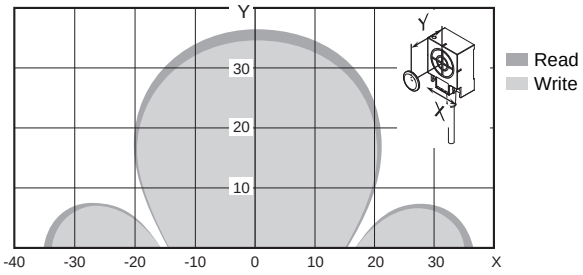
The communications areas given here are for reference only. For information on communications distances, refer to p.51.

The communications area depends on the type of RF Tags used, the ambient temperature, surrounding metals, and noise. Be sure to check carefully when installing the system.

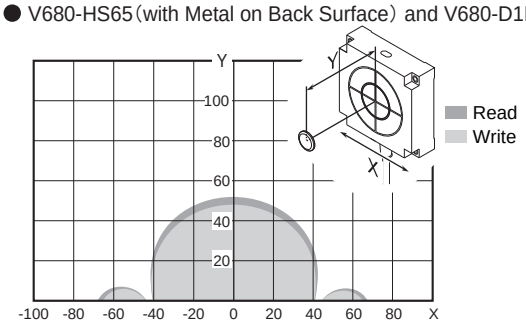
● V680-HS52（Embedded in Non-Metal） and V680-D1KP54T



● V680-HS63（with Non-Metal on Back Surface） and V680-D1KP54T



● V680-HS65（with Metal on Back Surface） and V680-D1KP54T

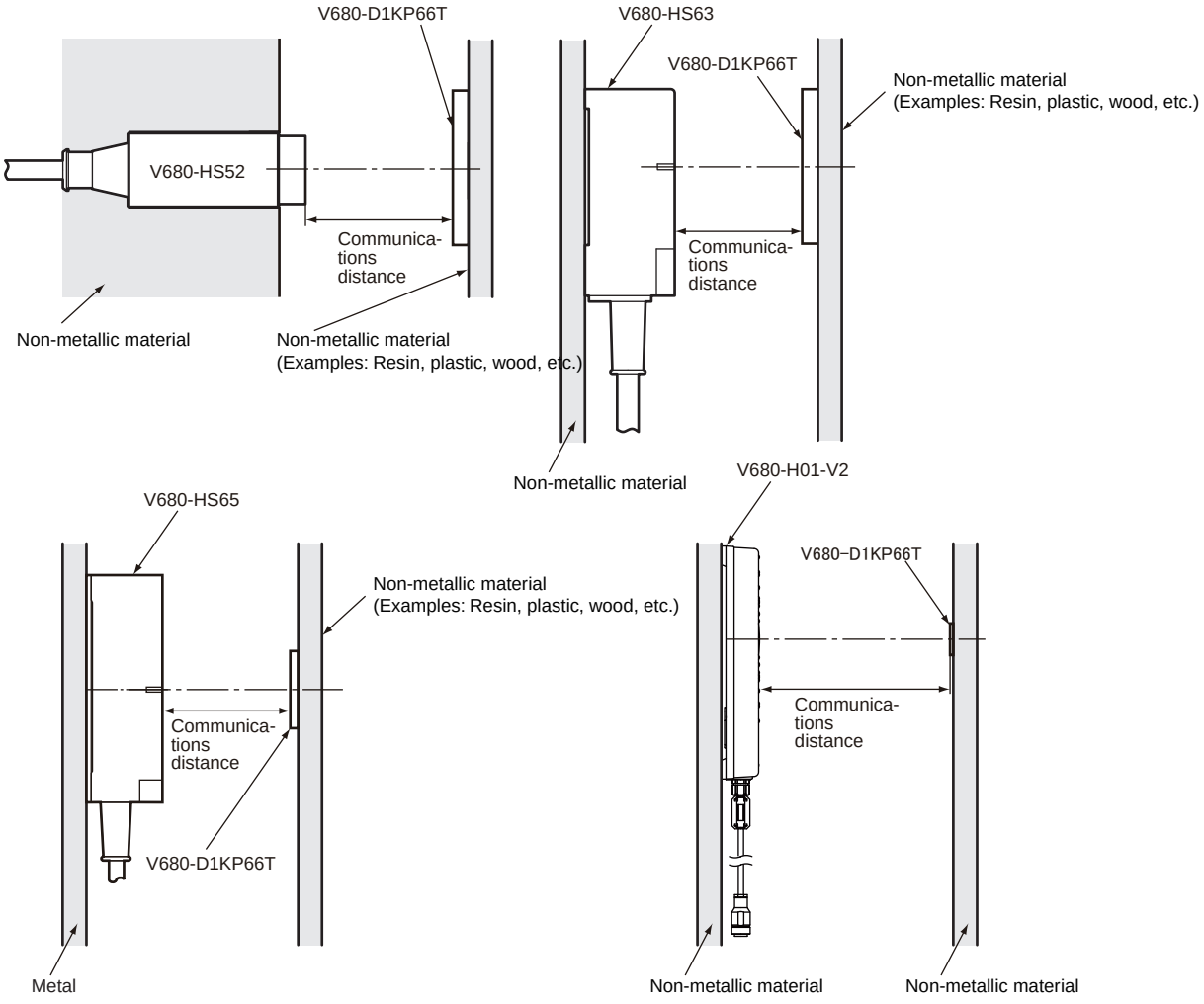


V680-D1KP66T

■ Communications Distance Specifications (Guaranteed)

Amplifier	Antenna	RF Tag	Communications distance	
V680-HA63A	V680-HS52	V680-D1KP66T	Read	0 to 17.0 mm (Axis offset: ±2 mm)
			Write	0 to 17.0 mm (Axis offset: ±2 mm)
	V680-HS63	V680-D1KP66T	Read	0 to 30.0 mm (Axis offset: ±10 mm)
			Write	0 to 25.0 mm (Axis offset: ±10 mm)
	V680-HS65	V680-D1KP66T	Read	0 to 47.0 mm (Axis offset: ±10 mm)
			Write	0 to 42.0 mm (Axis offset: ±10 mm)
---	V680-H01-V2	V680-D1KP66T	Read	0 to 100.0 mm (Axis offset: ±10 mm)
			Write	0 to 100.0 mm (Axis offset: ±10 mm)

• Measurement Conditions

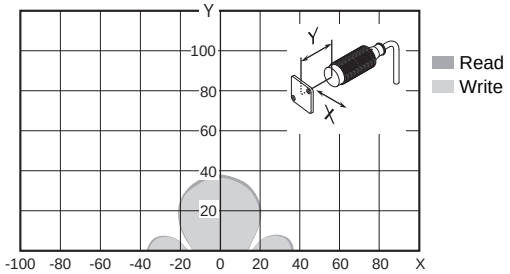


■ Communications Area (Reference)

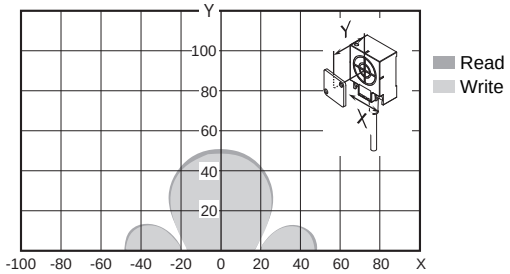
The communications areas given here are for reference only. For information on communications distances, refer to p.53.

The communications area depends on the type of RF Tags used, the ambient temperature, surrounding metals, and noise. Be sure to check carefully when installing the system.

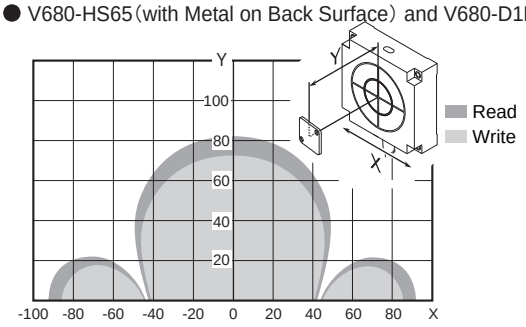
● V680-HS52（Embedded in Non-Metal） and V680-D1KP66T



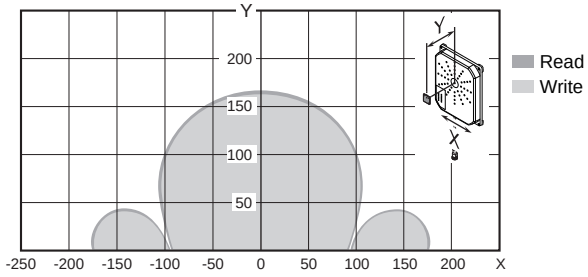
● V680-HS63（with Non-Metal on Back Surface） and V680-D1KP66T



● V680-HS65（with Metal on Back Surface） and V680-D1KP66T



● V680-H01-V2 and V680-D1KP66T

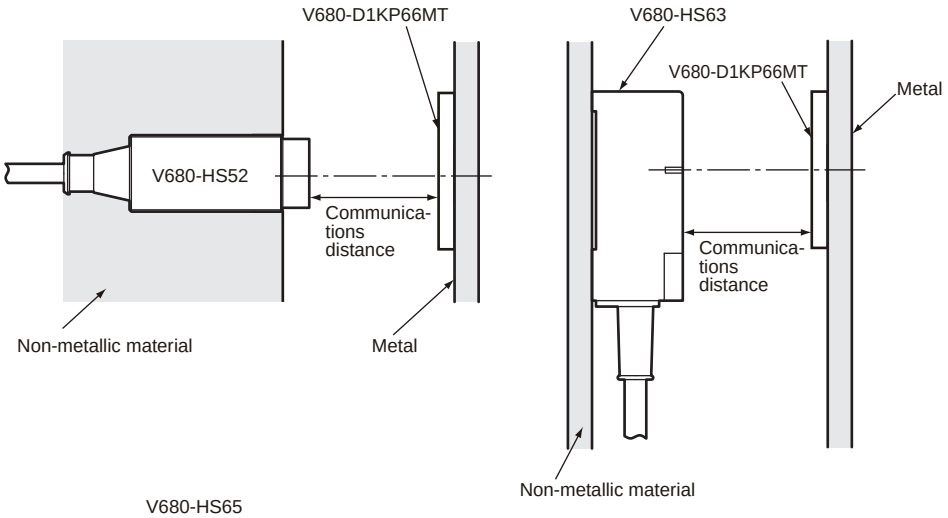


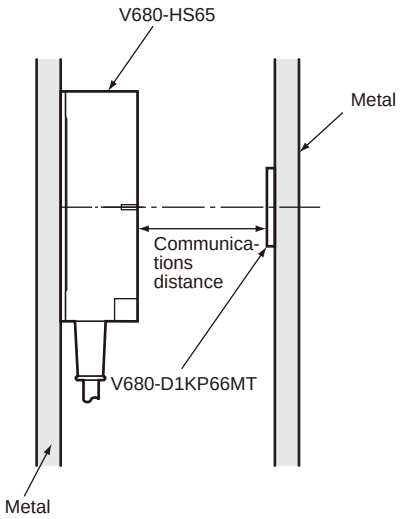
V680-D1KP66MT

■ Communications Distance Specifications (Guaranteed)

Amplifier	Antenna	RF Tag	Communications Distance	
V680-HA63A	V680-HS52	V680-D1KP66MT with metal on back surface (steel)	Read	0 to 16.0 mm (Axis offset: ±2 mm)
			Write	0 to 14.0 mm (Axis offset: ±2 mm)
	V680-HS63	V680-D1KP66MT with metal on back surface (steel)	Read	0 to 25.0 mm (Axis offset: ±10 mm)
			Write	0 to 20.0 mm (Axis offset: ±10 mm)
	V680-HS65	V680-D1KP66MT with metal on back surface (steel)	Read	0 to 25.0 mm (Axis offset: ±10 mm)
			Write	0 to 20.0 mm (Axis offset: ±10 mm)

• Measurement Conditions



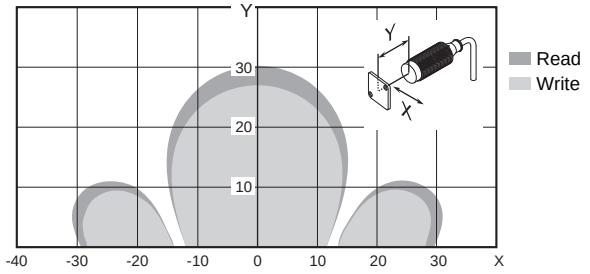


■ Communications Area (Reference)

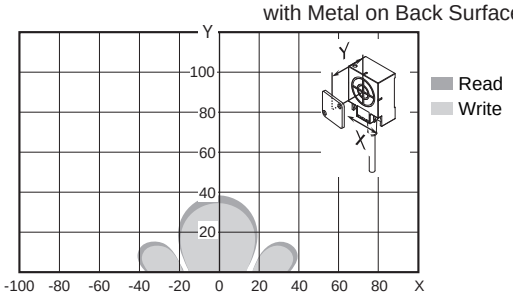
The communications areas given here are for reference only. For information on communications distances, refer to p.55.

The communications area depends on the type of RF Tags used, the ambient temperature, surrounding metals, and noise. Be sure to check carefully when installing the system.

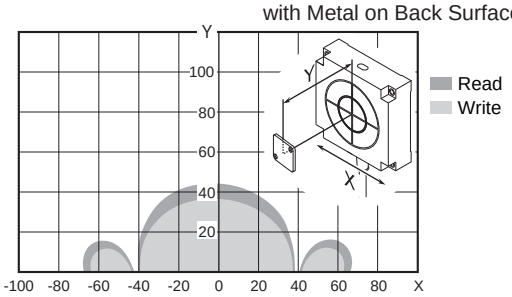
● V680-HS52（Embedded in Non-Metal） and V680-D1KP66MT with Metal on Back Surface (Steel)



● V680-HS63（with Non-Metal on Back Surface） and V680-D1KP66MT with Metal on Back Surface (Steel)



● V680-HS65（with Metal on Back Surface） and V680-D1KP66MT with Metal on Back Surface (Steel)

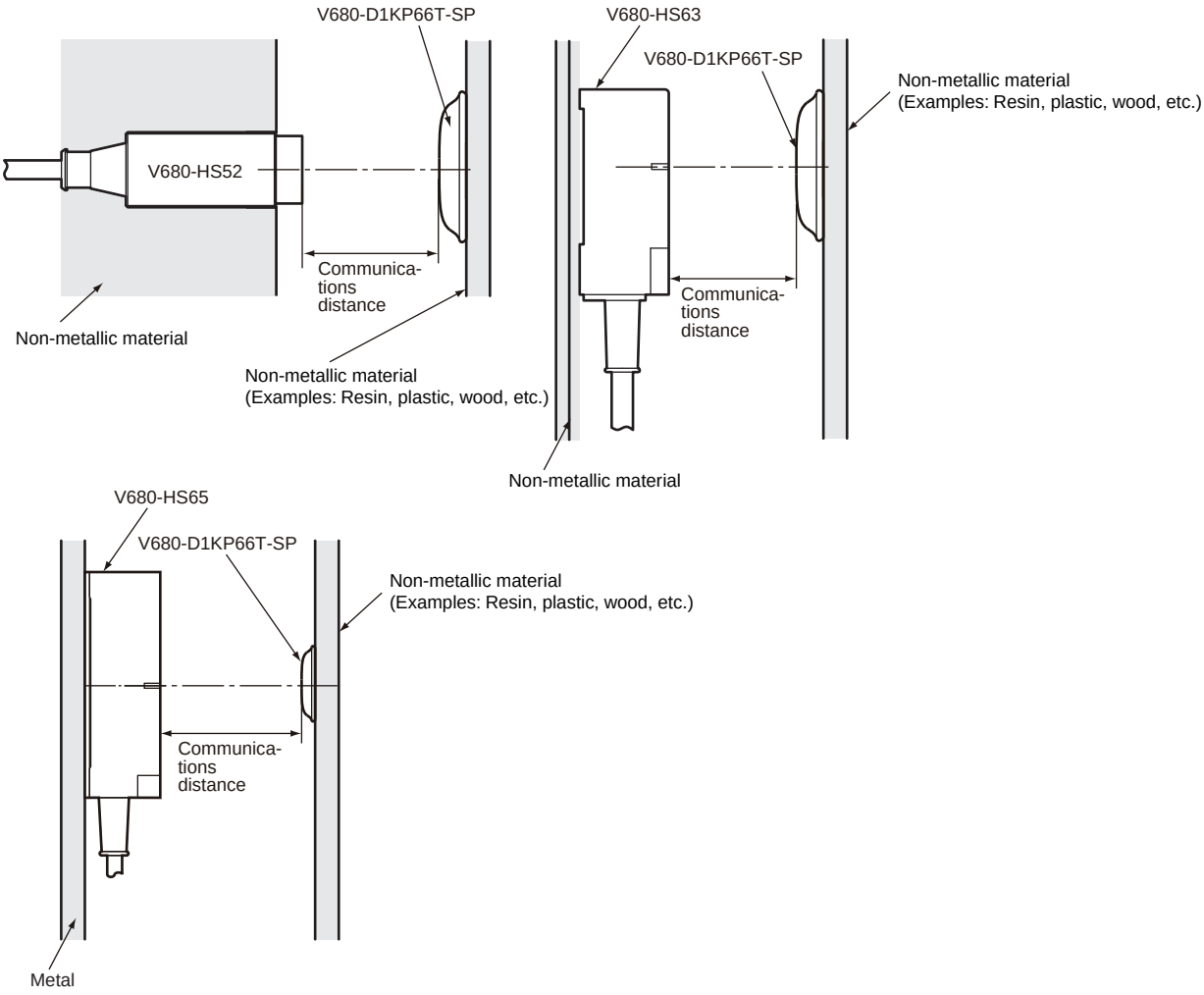


V680-D1KP66T-SP

■ Communications Distance Specifications (Guaranteed)

Amplifier	Antenna	RF Tag	Communications distance	
V680-HA63A	V680-HS52	V680-D1KP66T-SP	Read	0 to 15.0 mm (Axis offset: ±2 mm)
			Write	0 to 15.0 mm (Axis offset: ±2 mm)
	V680-HS63	V680-D1KP66T-SP	Read	0 to 25.0 mm (Axis offset: ±10 mm)
			Write	0 to 20.0 mm (Axis offset: ±10 mm)
	V680-HS65	V680-D1KP66T-SP	Read	0 to 42.0 mm (Axis offset: ±10 mm)
			Write	0 to 37.0 mm (Axis offset: ±10 mm)

• Measurement Conditions

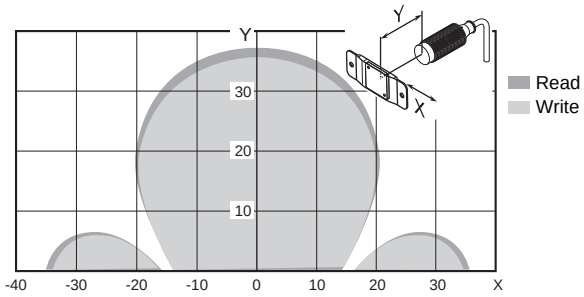


■ Communications Area (Reference)

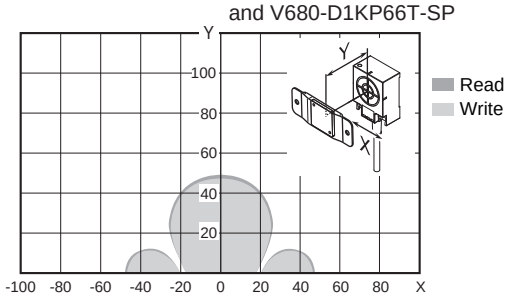
The communications areas given here are for reference only. For information on communications distances, refer to p.57.

The communications area depends on the type of RF Tags used, the ambient temperature, surrounding metals, and noise. Be sure to check carefully when installing the system.

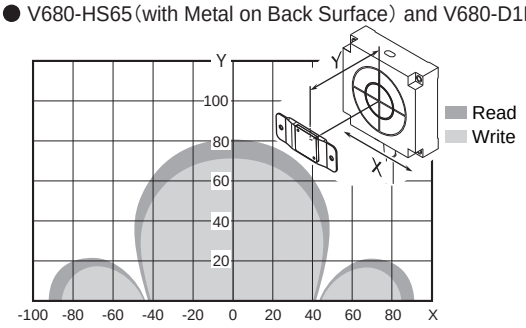
● V680-HS52（Embedded in Non-Metal） and V680-D1KP66T-SP



● V680-HS63（with Non-Metal on Back Surface） and V680-D1KP66T-SP



● V680-HS65（with Metal on Back Surface） and V680-D1KP66T-SP

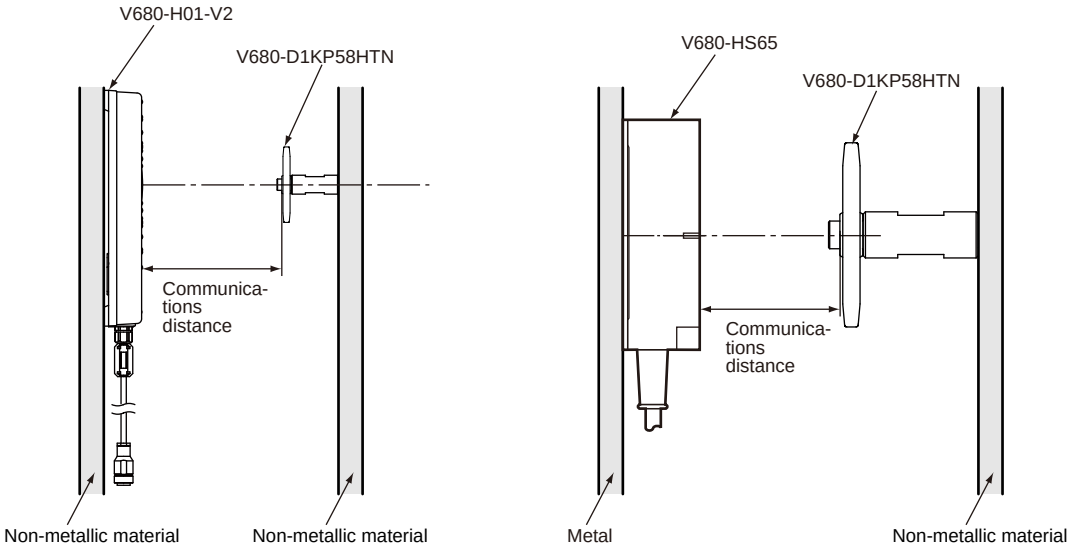


V680-D1KP58HTN

■ Communications Distance Specifications (Guaranteed)

Amplifier	Antenna	RF Tag	Communications distance	
V680-H01-V2		V680-D1KP58HTN	Read	0 to 150.0 mm (Axis offset: ±10mm)
			Write	0 to 150.0 mm (Axis offset: ±10mm)
V680-HA63A	V680-HS65	V680-D1KP58HTN	Read	0 to 55.0 mm (Axis offset: ±10mm)
			Write	0 to 50.0 mm (Axis offset: ±10mm)

• Measurement Conditions

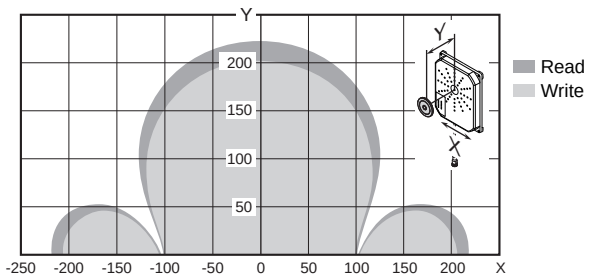


■ Communications Area (Reference)

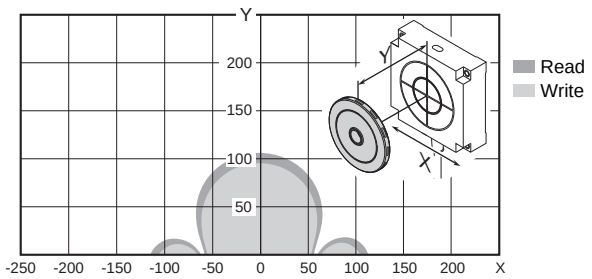
The communications areas given here are for reference only. For information on communications distances, refer to the above table.

The communications area depends on the type of RF Tags used, the ambient temperature, surrounding metals, and noise. Be sure to check carefully when installing the system.

● V680-H01-V2 and V680-D1KP58HTN



● V680-HS65(with Metal on Back Surface) and V680-D1KP58HTN



Communication Time (Reference)

Communications Time (Reference)

■ Communications Time

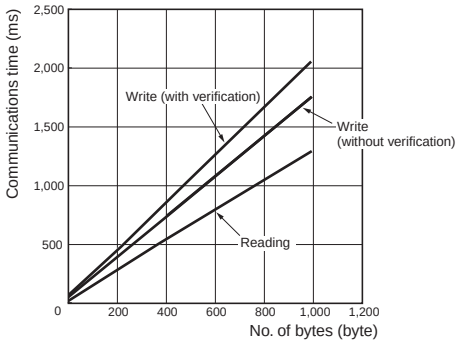
V680-HA63A:V680-HS□□:V680-H01-V2:V680-D1KP□□

Communications speed setting	Command	Communications time N: No. of bytes processed
Normal mode	Read	T = 1.3 N + 31
	Write (with verification)	T = 2.1 N + 58
	Write (without verification)	T = 1.8 N + 56
High-speed mode (See note.)	Read	T = 1.0 N + 29
	Write (with verification)	T = 1.8 N + 51
	Write (without verification)	T = 1.5 N + 47

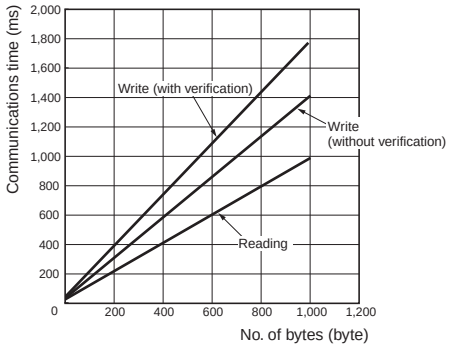
Note: When using multi-access or FIFO communications options, normal-mode communications speed will be used regardless of the high-speed mode setting.

Note: The high-speed mode cannot be used when SW1-1 on the V680-H01-V2 Antenna is turned ON.

Communications speed: Normal mode



Communications speed: high-speed mode

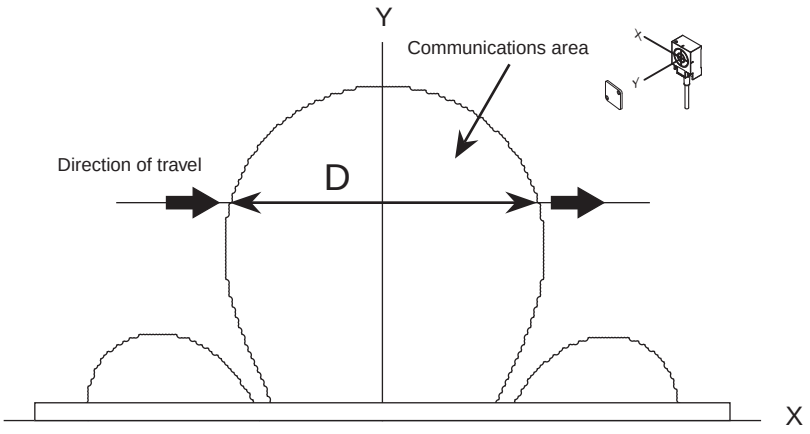


Calculating RF Tag Speed

When communicating with a moving RF Tag, specify an AUTO command or POLLING command.
The maximum speed for communicating with the RF Tag can be calculated simply using the following formula.

$$\text{Maximum speed} = \frac{\text{D (Distance travelled in communications area)}}{\text{T (Communications time)}}$$

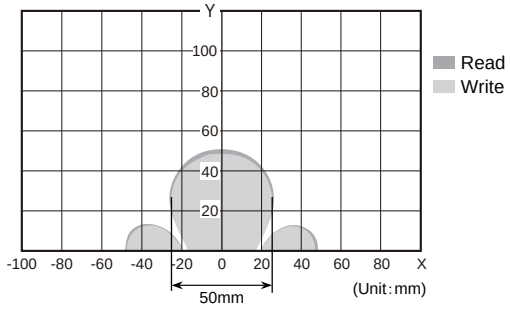
D (Distance travelled in communications area) is calculated from the actual measurement or the communications area between the Antenna and RF Tag.



Unit: mm

Calculation Example

In this example diagram, the V680-D1KP66T, V680-HA63A, and V680-HS63 are combined and 256 bytes are read.



This diagram shows the following:
Distance travelled in communications area (D) = 50 mm when Y (communications distance) = 20 mm
Communications time, T = 1.3N +31 = 1.3 × 256 + 31 = 363.8 (ms)
Accordingly, the movement speed in this case will be as follows:

$$\frac{\text{Distance travelled in communications area}}{\text{Communications time}} = \frac{50\ (\text{mm})}{363.8\ (\text{ms})}$$

$$= 8.24\ \text{m/min}$$

Note
1. The distance travelled in the communications area depends on the read/write distance and the axis offset. Refer to the diagrams in *Communications Area*.
2. The speed of the RF Tag is provided as a guideline. Before using the RFID System, run a test to determine the speed under actual operating conditions.
3. The above values do not take into account the processing of errors in communications with the host device or RF Tags.

MEMO

Section 4
Installation

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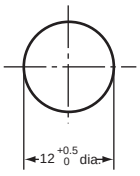
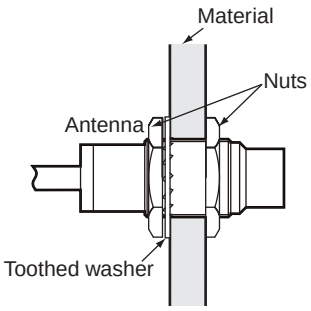
Installing Antennas

V680-HS51

Install the Antenna using the nuts and toothed washers that are provided on both sides of the mounting material, as shown in the diagram below.

Mounting Hole Dimensions





CHECK!

Securely tighten the screws to a maximum torque of 6 N·m.

V680-HS52

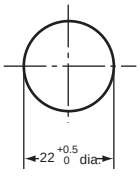
Install the Antenna using the nuts and toothed washers that are provided on both sides of the mounting material, as shown in the diagram below.

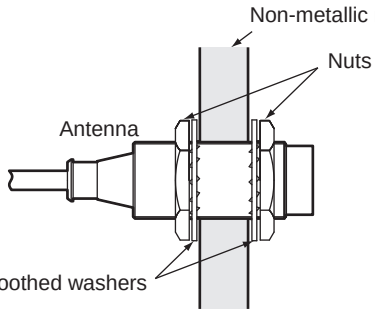
CHECK!

When the Antenna is mounted to a metal object, the communications distance will be reduced by approximately 10% compared with mounting to a non-metallic object. For details on the effect of metal surrounding the Antenna, refer to *Effect of Surrounding Metals on the Antenna (Reference)* on page 69.

P.69

Mounting Hole Dimensions



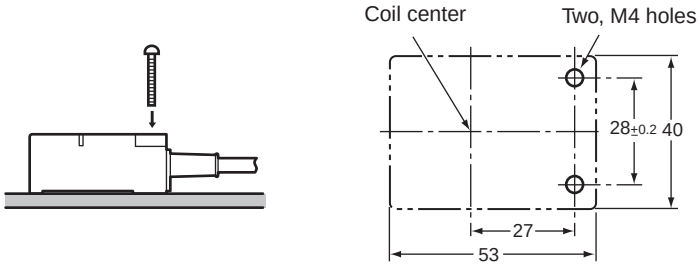


CHECK!

Securely tighten the screws to a maximum torque of 40 N·m.

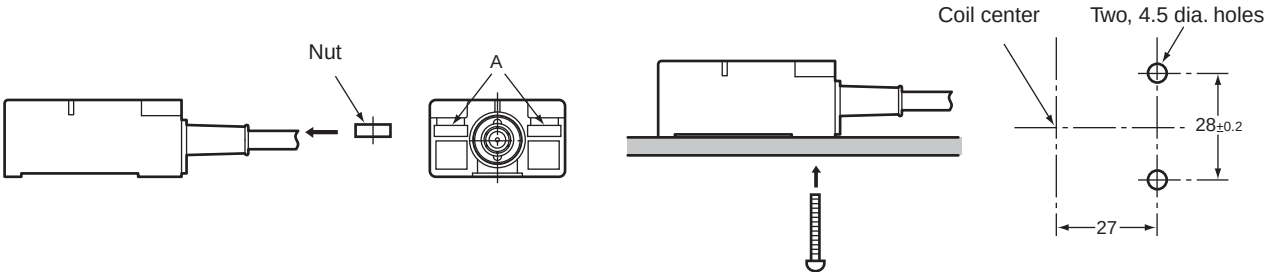
V680-HS63

■ Installation from the Front



■ Installation from the Back

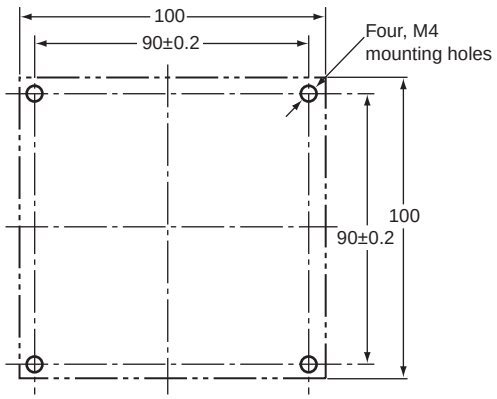
Insert the nuts that come with the Antenna into sections A.



CHECK!

Securely tighten screws to a maximum torque of 1.2 N·m.

V680-HS65

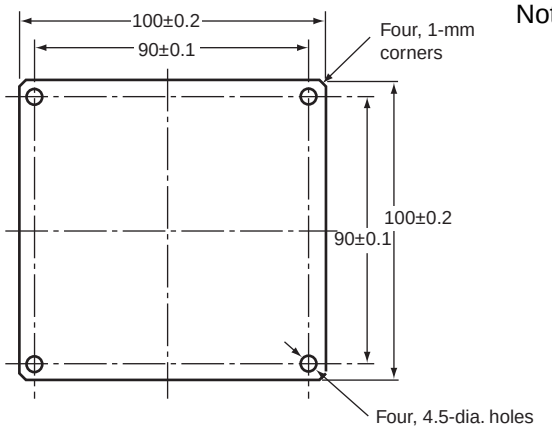


Use M4 screws and spring washers (in four places) for Antenna installation.
Tighten the screws to a torque of 0.7 to 1.2 N·m.
There are no restrictions on the mounting direction or the direction of access to the RF Tag, but if the Antenna is to be installed near a device such as a conveyance belt, make sure there is no danger of the Antenna being accidentally struck.

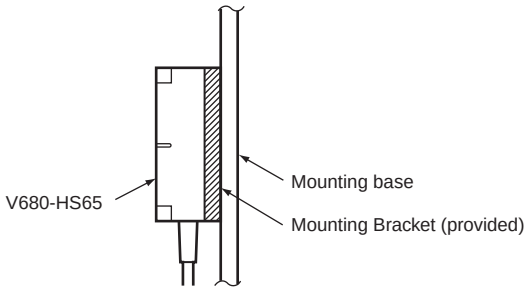
CHECK!

Securely tighten screws to a torque of 0.7 to 1.2 N·m.

■ Mounting Bracket Dimensions (Provided Only with the V680-HS65)

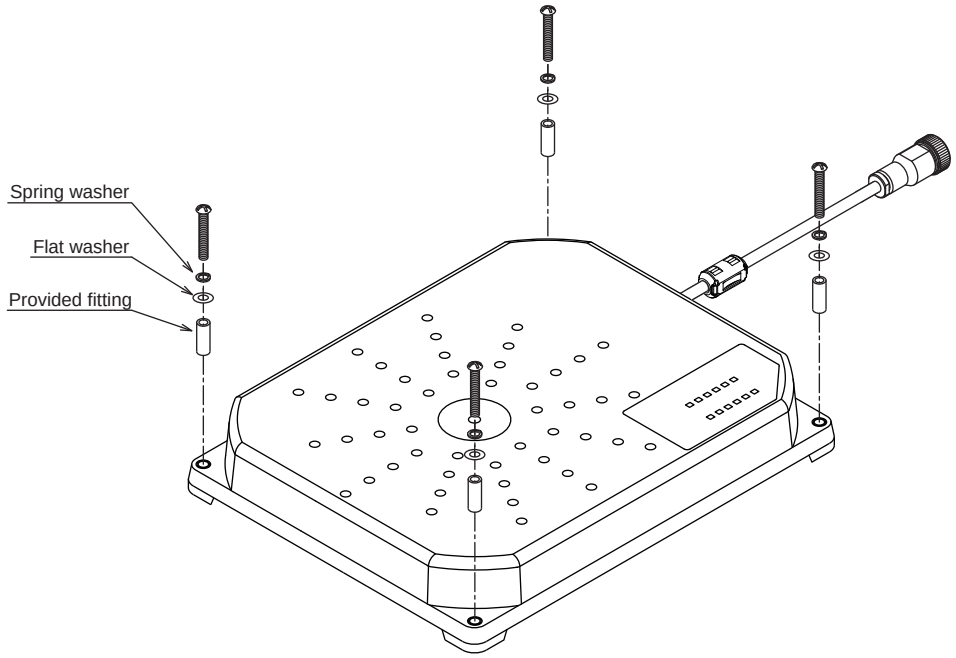


Note: When installing the Antenna, mount it on the enclosed Mounting Bracket. The Mounting Bracket is not necessary, however, if the Antenna is mounted on a metal base that is larger than the Antenna (100 × 100 mm).

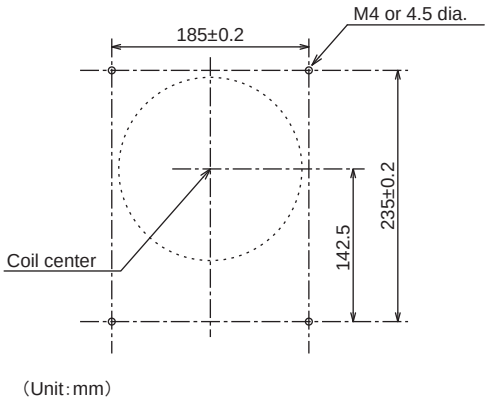


V680-H01-V2

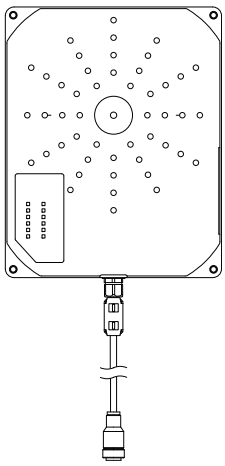
Be sure to insert the provided fittings into the Antenna mounting holes and mount the Antenna with four M4 screws with spring washers and flat washers as shown below.



Mounting Hole Dimensions



(Unit: mm)



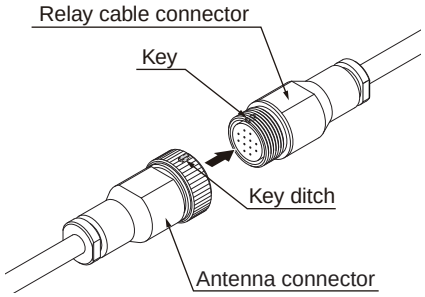
CHECK!

Securely tighten screws to a maximum torque of 1.2 N·m.

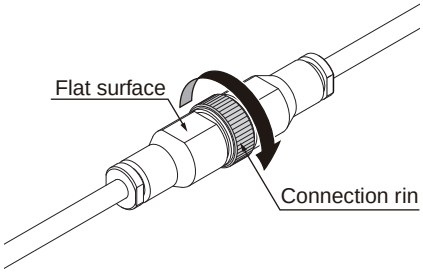
■ Connecting and Disconnecting Relay Cables

▪ Mounting the Antenna

1. Align the key on the relay cable connector with the key slot on the Antenna connector and push the connector all the way in.

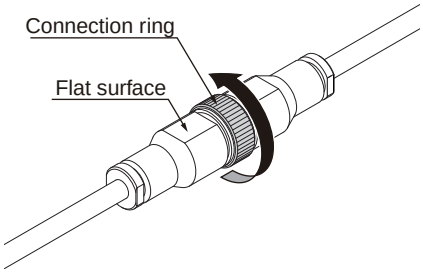


2. Hold the flat surfaces on the Antenna connector with a wrench, and turn the connection ring clockwise to secure the connector

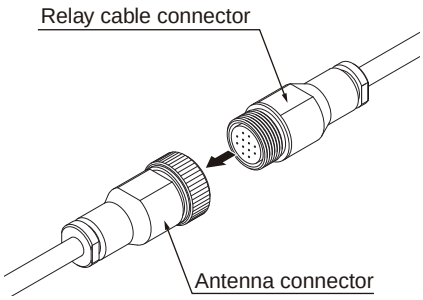


▪ Removing the Antenna

1. Hold the flat surfaces on the Antenna connector with a wrench, and turn the connection ring counterclockwise to loosen the connector.



2. Make sure that the connection ring is sufficiently loose, and then pull the connector straight out.



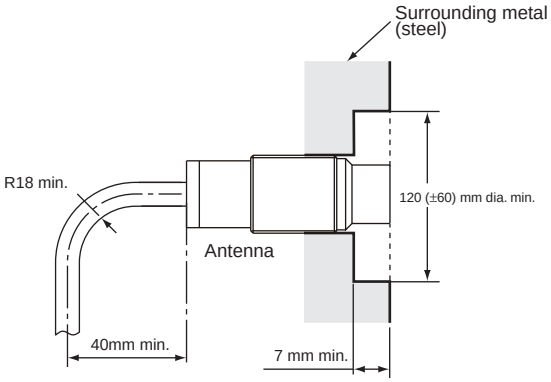
CHECK! When loosening the connection ring, always hold the flat surfaces on the Antenna connector with a wrench. If the connection ring is loosened without holding the Antenna connector, the relay cable may be damaged or wire inside the relay cable may break.

CHECK! The connector cannot be pulled out without first loosening the connection ring. Completely loosen the connection ring before pulling out the connector. Pulling on the cable without sufficiently loosening the connection ring may cause the cable to be damaged or wire inside the cable may break.

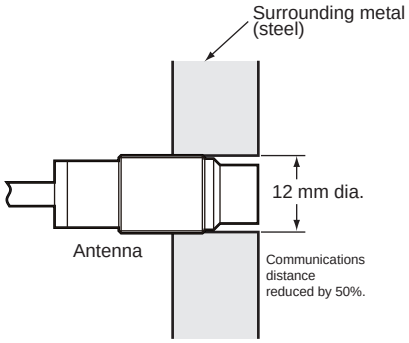
Effect of Surrounding Metals on the Antenna (Reference)

■ V680-HS51

When embedding the Antenna in metal, be sure the metal does not extend beyond the tip of the Antenna.



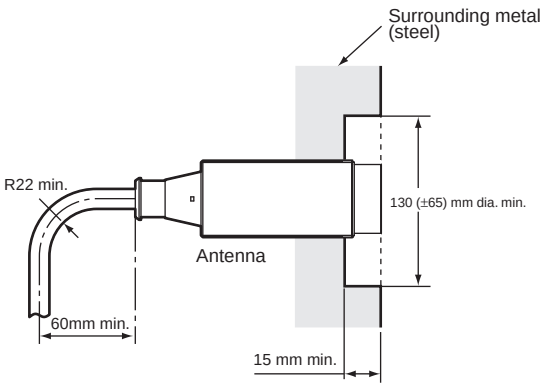
Do not bend the cable into a curve tighter than 18 mm in radius.



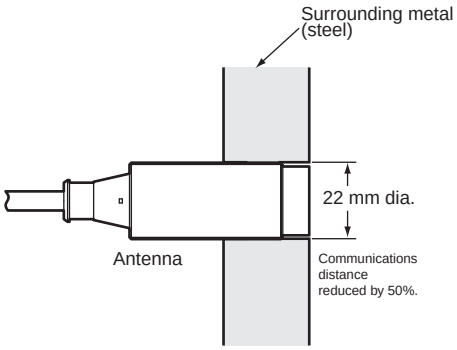
If the metal around the Antenna reaches the coil surface, the communications distance will be reduced significantly compared with mounting to a non-metallic surface.

■ V680-HS52

When embedding the Antenna in metal, be sure the metal does not extend beyond the tip of the Antenna.



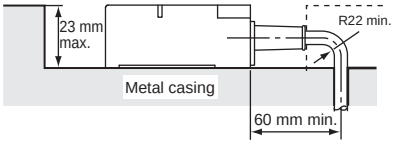
Do not bend the cable into a curve tighter than 22 mm in radius.

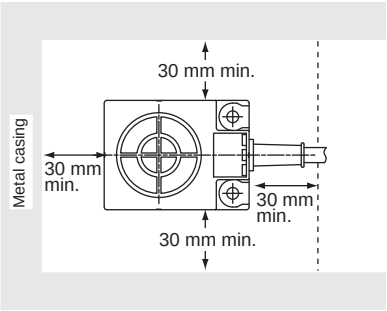


If the metal around the Antenna reaches the coil surface, the communications distance will be reduced significantly compared with mounting to a non-metallic surface.

■ V680-HS63

In addition to surface mounting, it is also possible to embed the V680-HS63 in a metal casing to protect it from being struck by other objects. To prevent malfunctioning, allow a space of at least 30 mm between the Antenna and the sides of the metal casing. If the space is less than 30 mm, the read/write distance will be greatly diminished. In addition, the height of metal casing must not exceed that of the Antenna.

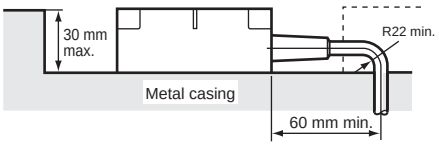


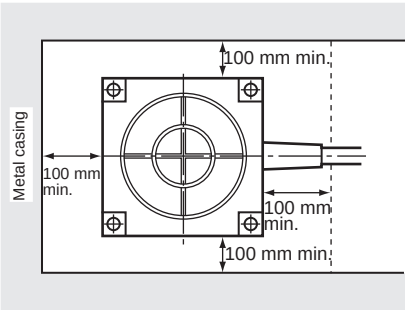


Note
1. Do not bend the cable into a curve tighter than 22 mm in radius.
2. The communications distance will be reduced significantly if the Antenna is installed closer than 30 mm to metal surfaces.

■ V680-HS65

In addition to surface mounting, it is also possible to embed the V680-HS65 in a metal casing to protect it from being struck by other objects. To prevent malfunctioning, allow a space of at least 100 mm between the Antenna and the sides of the metal casing. If the space is less than 100 mm, the read/write distance will be greatly diminished. In addition, the height of metal casing must not exceed that of the Antenna.





Note
1. Do not bend the cable into a curve tighter than 22 mm in radius.
2. The communications distance will be reduced significantly if the Antenna is installed closer than 100 mm to metal surfaces.

■ V680-H01-V2

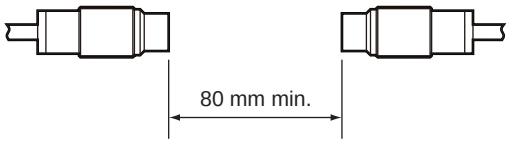
If the Antenna is mounted to a metal object, the communications area will be reduced by approximately 10%compared with mounting to a non-metal object. Consider this influence on performance when mounting the Antenna.

Mutual Interference between Antennas (Reference)

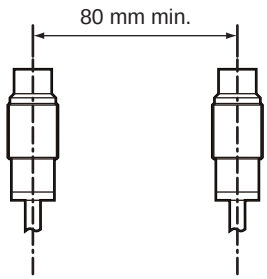
To prevent malfunctioning due to mutual interference when using more than one Antenna, leave sufficient space between them as shown in the following diagrams.

■ V680-HS51

• Installing the Antennas Facing Each Other

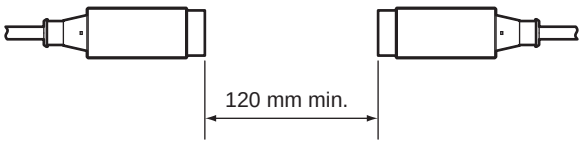


• Installing the Antennas in Parallel

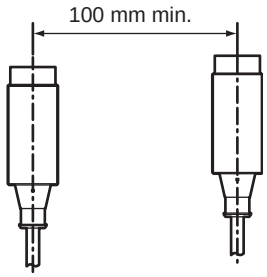


■ V680-HS52

• Installing the Antennas Facing Each Other

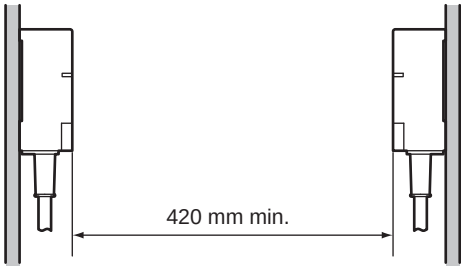


• Installing the Antennas in Parallel

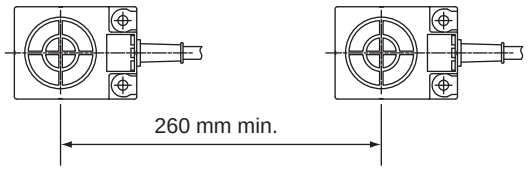


■ V680-HS63

• Installing the Antennas Facing Each Other

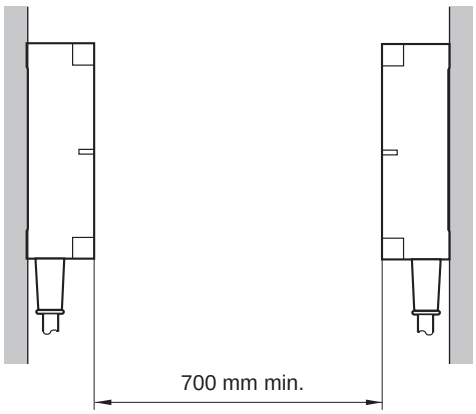


• Installing the Antennas in Parallel

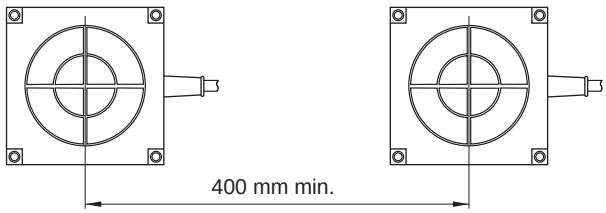


■ V680-HS65

• Installing the Antennas Facing Each Other



• Installing the Antennas in Parallel



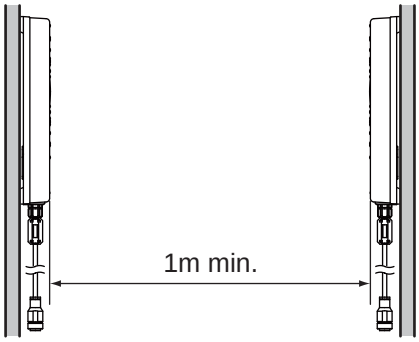
■ V680-H01-V2

When installing multiple Read/Write Antennas adjacently, make sure that the Antenna communications area do not overlap.

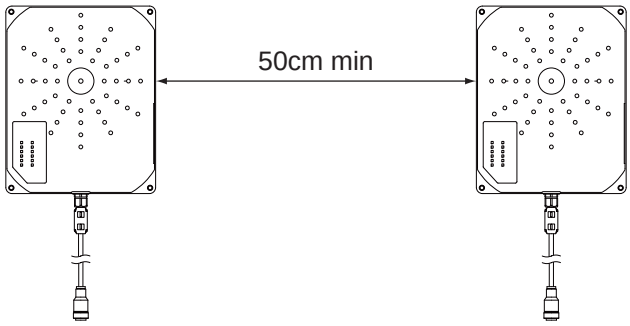
For details on the Antenna communications area, refer to Communications Area (Reference).

As a guide, the following diagrams show the minimum distances required between two Antennas installed facing each other or in parallel. Be sure to provide the distance between Antennas shown here.

• Installing the Antennas Facing Each Other



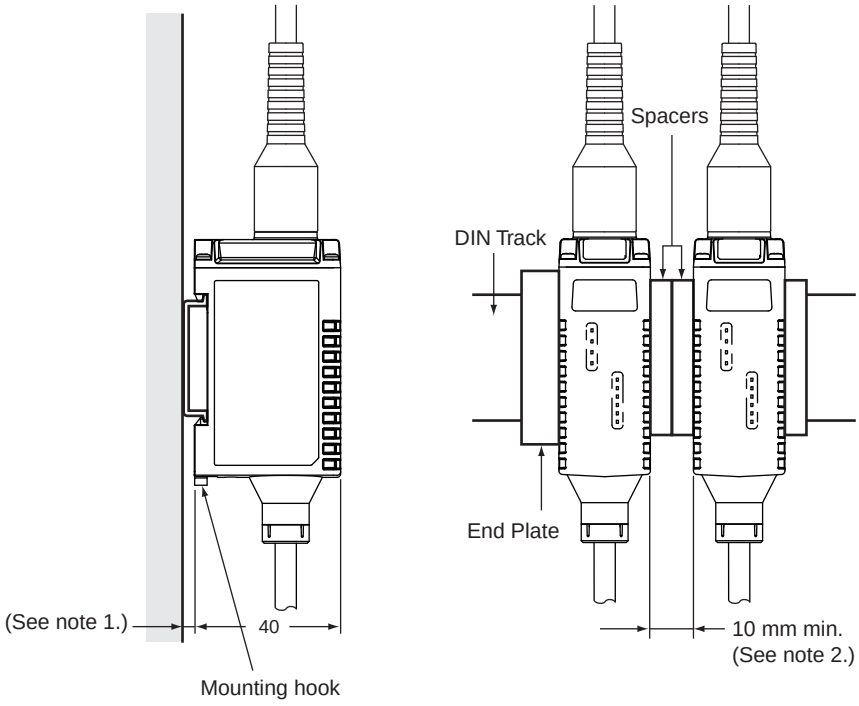
• Installing the Antennas in Parallel



Mounting Amplifiers

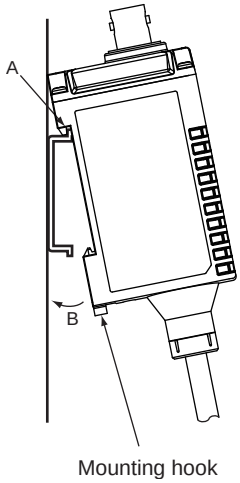
V680-HA63A

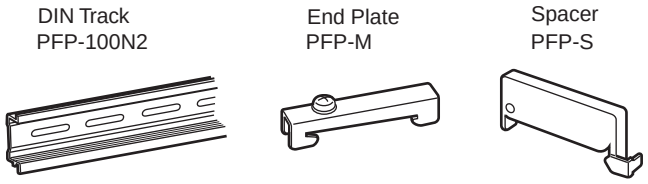
■ Mounting to DIN Track



Note 1. Consider the height of the DIN Track.

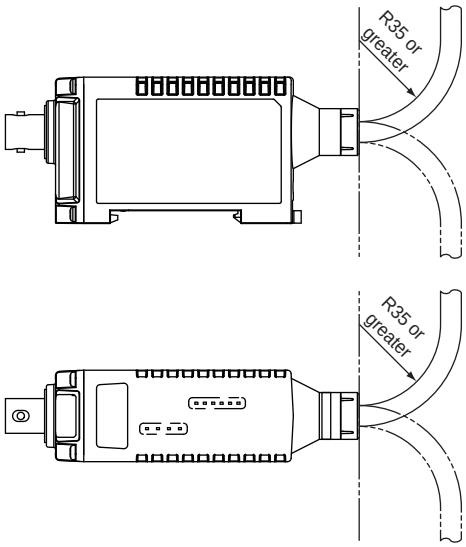
2. Provide a space of at least 10 mm (i.e., at least two spacers) and attach them securely.





1. When mounting the Amplifier to a DIN Track, first hook section A to the Track and then press in direction B.
2. To remove the Amplifier from the DIN Track, first pull out the mounting hook.

Amplifier Cable Bending Radius

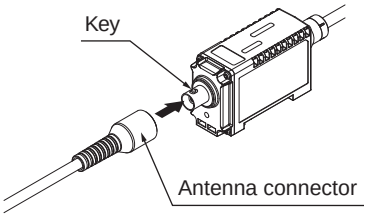


Do not bend the cable past a bending radius of 35 mm.

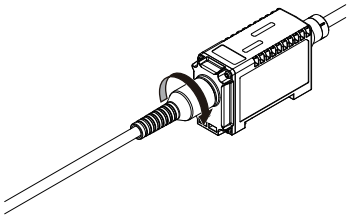
Attaching/Removing Amplifire and Antenna Connectors

■ Attaching the Connector

1. Hold the Antenna connector, align the key, and insert the connector into the Amplifier connector.

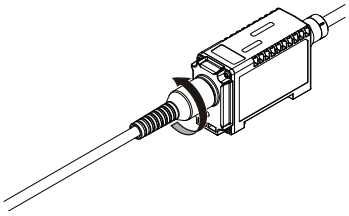


2. Turn the connector clockwise to lock it in place.

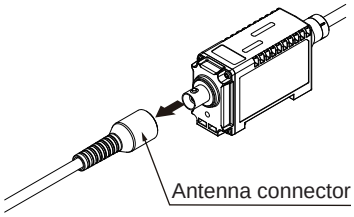


■ Removing the Connector

1. Turn the connector counterclockwise to release the lock.



2. Pull the Antenna connector straight out.



CHECK!

The connector will not come out unless the lock is first released by turning the connector. To remove the cable, release the lock and pull on the connector. Pulling the cable without releasing the lock may break or damage the cable.

CHECK!

Do not pull the Antenna connector over the power of 30 N.
The Antenna connector may be broken.

Installing RF Tags

V680-D1KP52MT

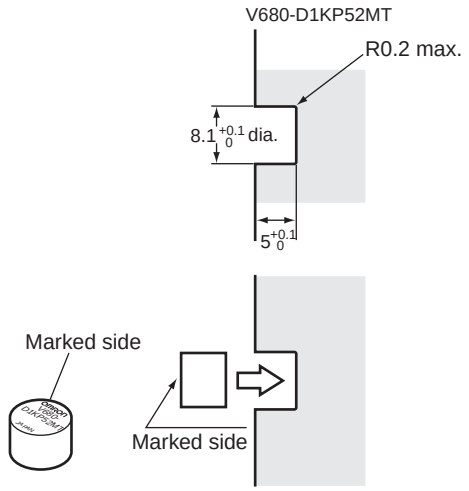
■ RF Tag Installation Direction

Mount RF Tags as shown in the diagram on the right.

Please select the adhesive matched to the bonded material. And defend decided dosage and usage. And confirm and use the tidy fixation.

Because the material of RF Tag is PPS resin, the epoxy-based adhesives are recommended to bonding to the metal and the rigid plastic.

The epoxy adhesives listed in the following table are recommended for the given temperature ranges.



Ambient operating temperature	Product name	Manufacturer
-40 to 70°C	Two-part Epoxy-compound Resin: TB2001 (main agent)/ TB2105C (curing agent)	Three Bond Co., Ltd.
	One-part Moisture-curing Elastic Adhesive TB1530	Three Bond Co., Ltd.
-40 to 150°C	One-part Epoxy Resin: TB2285	Three Bond Co., Ltd.
	Two-part Epoxy Resin: TB2087	Three Bond Co., Ltd.

CHECK!

When embedding the V680-D1KP52MT into a metal surface, use the V680-HS51/-HS52 Antenna. Transmission will not be possible if the V680-HS63 Antenna is used.

■ Differences in Surrounding Metals

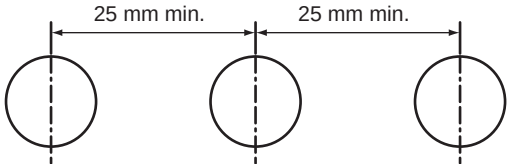
Communications distances are affected by the type of metal in back of or surrounding the RF Tag, as shown in the following table.

	Steel	SUS	Brass	Aluminum
V680-D1KP52MT	100%	85% to 90%	80% to 85%	80% to 85%

The values for steel are set to 100%

■ Mutual Interference with RF Tags (Reference)

Provide the mounting distances indicated below to prevent malfunctions due to mutual interference when using more than one RF Tag.



■ Influence of Angle (Reference)

Install Antennas and RF Tags as parallel to each other as possible.

Communications are possible even when an Antenna and a RF Tag are mounted at an angle, but the communications distance will be shortened. The relation between the angle and the communications distance is shown below.

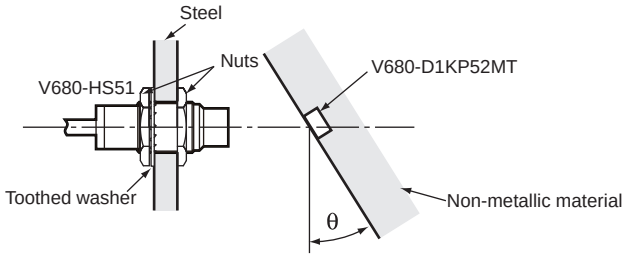
▪ **Percentage Drop in Communications Distance According to Angle of V680-D1KP52MT**

	RF Tag angle (θ°)				
	0	**10**	**20**	**30**	**40**
V680-HS51 and V680-D1KP52MT	0%	-1%	-5%	-10%	-15%
V680-HS51 and V680-D1KP52MT (Metal: Steel)	0%	0%	0%	-4%	-28%
V680-HS52 and V680-D1KP52MT	0%	0%	0%	-2%	-6%
V680-HS52 and V680-D1KP52MT (Metal: Steel)	0%	-6%	-13%	-25%	-
V680-HS63 and V680-D1KP52MT	0%	-2%	-5%	-9%	-14%

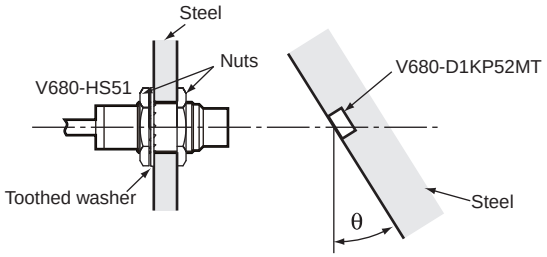
-: The measurement is no possible because the RF Tag comes in contact with the Antenna.

▪ **Measurement Conditions**

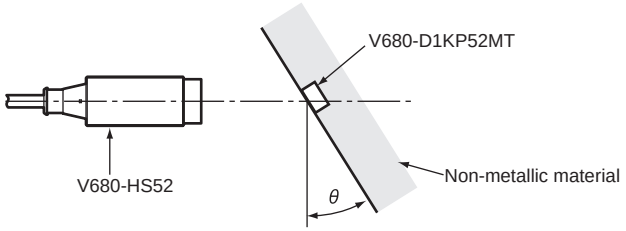
•V680-HS51 and V680-D1KP52MT



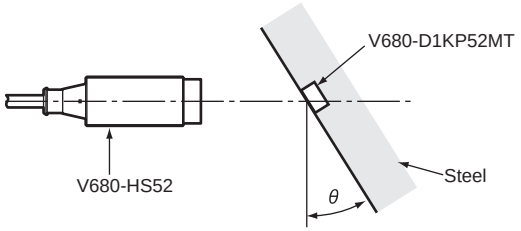
• V680-HS51 and V680-D1KP52MT (Metal: Steel)



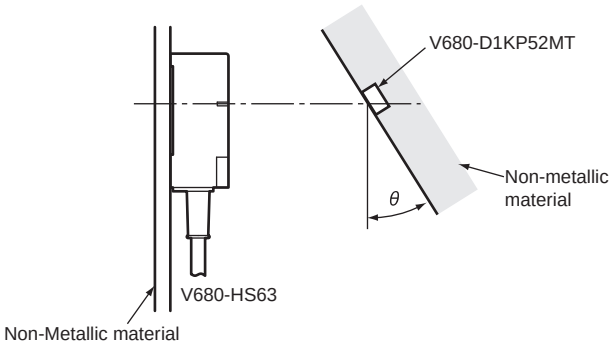
•V680-HS52 and V680-D1KP52MT



• V680-HS52 and V680-D1KP52MT (Metal: Steel)



•V680-HS63 and V680-D1KP52MT

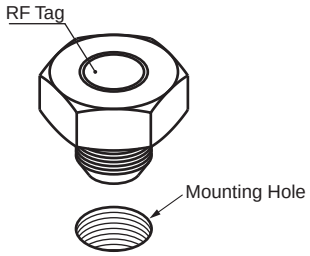


V680-D1KP52M-BT01/-D1KP52M-BT11

■ RF Tag Installation Direction

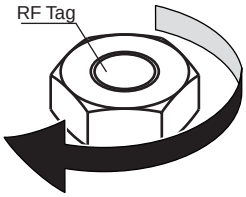
1. Turn the RF Tag clockwise, attach to the Mounting holes.

CHECK! V680-D1KP52M-BT01 is attached to the mounting holes in the M10, V680-D1KP52M-BT11 to the mounting holes in the M8.



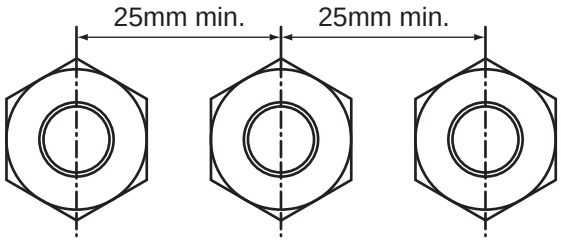
2. Secure by tightening the bolts of the RF Tag.

CHECK! When mounting the RF Tag, tighten the bolts to the following torques.
V680-D1KP52M-BT01: 24.5 N·m
V680-D1KP52M-BT11: 11 N·m



■ Mutual Interference with RF Tags (Reference)

Provide the mounting distances indicated below to prevent malfunctions due to mutual interference when using more than one RF Tag.



■ Influence of Angle (Reference)

Install Antennas and RF Tags as parallel to each other as possible.

Communications are possible even when an Antenna and a RF Tag are mounted at an angle, but the communications distance will be shortened. The relation between the angle and the communications distance is shown below.

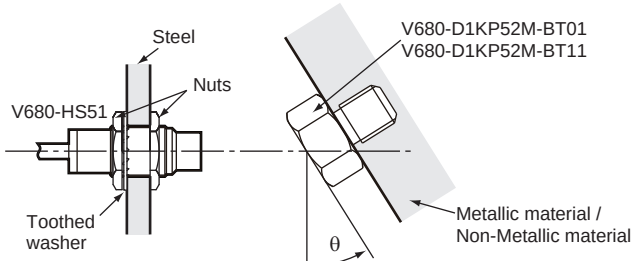
▪ **Percentage Drop in Communications Distance According to Angle of V680-D1KP52M-BT01/-D1KP52M-BT11**

	RF Tag angle (θ°)				
	0	10	20	30	40
V680-HS51 and V680-D1KP52M-BT01/D1KP52M-BT11	0%	-18%	-36%	-	-
V680-HS52 and V680-D1KP52M-BT01/D1KP52M-BT11	0%	-34%	-50%	-	-

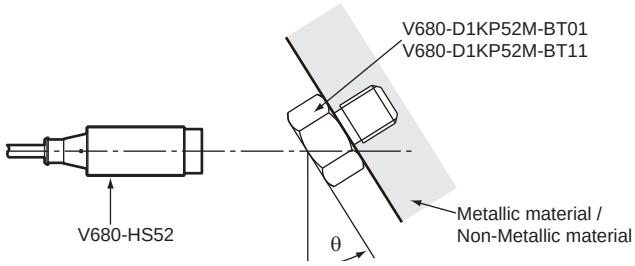
-: The measurement is no possible because the RF Tag comes in contact with the Antenna.

▪ **Measurement Conditions**

•V680-HS51 and V680-D1KP52M-BT01/D1KP52M-BT11



• V680-HS52 and V680-D1KP52M-BT01/D1KP52M-BT11



V680-D1KP53M

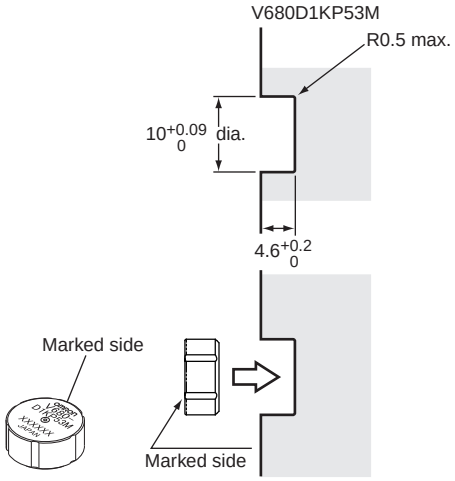
■ RF Tag Installation Direction

Mount RF Tags as shown in the diagram on the right.

Please select the adhesive matched to the bonded material. And defend decided dosage and usage. And confirm and use the tidy fixation.

Because the material of RF Tag is PPS resin, the epoxy-based adhesives are recommended to bonding to the metal and the rigid plastic.

The epoxy adhesives listed in the following table are recommended for the given temperature ranges.



Ambient operating temperature	Product name	Manufacturer
−40 to 70°C	Two-part Epoxy-compound Resin: TB2001 (main agent)/ TB2105C (curing agent)	Three Bond Co., Ltd.
	One-part Moisture-curing Elastic Adhesive TB1530	Three Bond Co., Ltd.
−40 to 150°C	One-part Epoxy Resin: TB2285	Three Bond Co., Ltd.
	Two-part Epoxy Resin: TB2087	Three Bond Co., Ltd.

CHECK!

When embedding the V680-D1KP53M into a metal surface, use the V680-HS51/-HS52 Antenna. Transmission will not be possible if the V680-HS63 Antenna is used.

▪ Differences in Surrounding Metals(Reference)

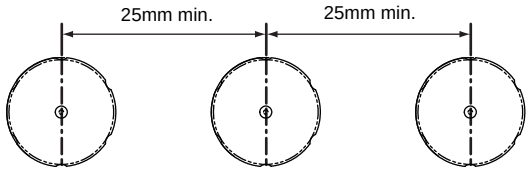
Communications distances are affected by the type of metal in back of or surrounding the RF Tag, as shown in the following table.

	Steel	SUS	Brass	Aluminum
V680-D1KP53M	100%	90% to 95%	90% to 95%	90% to 95%

Note: The value for steel around or behind the RF Tag is set to 100%.

▪ Mutual Interference with RF Tags (Reference)

To prevent malfunctioning due to mutual interference when using more than one RF Tag, leave sufficient space between them as shown in the following diagram.



▪ Influence of RF Tag Angle (Reference)

Install Antennas and RF Tags as parallel to each other as possible.

Communications are possible even when an Antenna and an RF Tag are mounted at an angle, but the communications distance will be shortened. The relation between the angle and the communications distance is shown below.

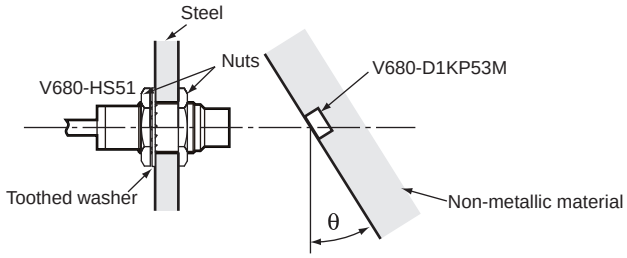
▪ Percentage Drop in Communications Distance According to Angle of V680-D1KP52MT

	RF Tag angle (θ°)				
	0	10	20	30	40
V680-HS51 and V680-D1KP53M	0%	−1%	−5%	−10%	−15%
V680-HS51 and V680-D1KP53M (Metal on back: Steel)	0%	0%	0%	−4%	−28%
V680-HS52 and V680-D1KP53M	0%	0%	0%	−2%	−6%
V680-HS52 and V680-D1KP53M (Metal on back: Steel)	0%	−6%	−13%	−25%	---

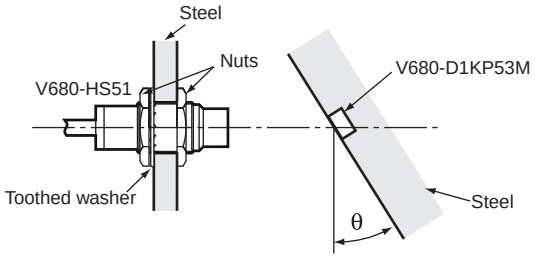
---: Measurement is not possible because Antenna and RF Tag would strike each other.

▪ Measurement Conditions

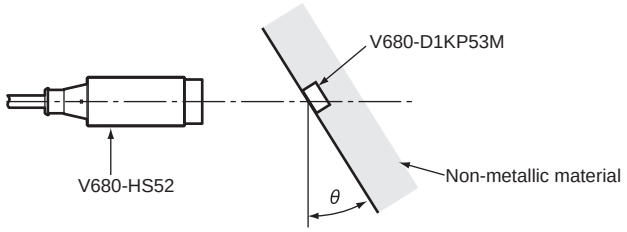
•V680-HS51 and V680-D1KP53M



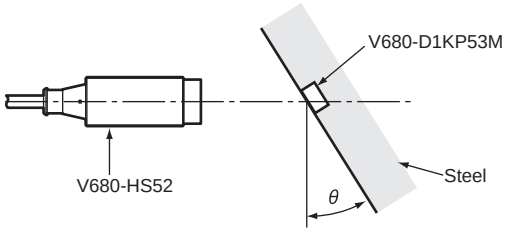
• V680-HS51 and V680-D1KP53M (Metal: Steel)



•V680-HS52 and V680-D1KP53M



• V680-HS52 and V680-D1KP53M (Metal: Steel)



V680-D1KP54T

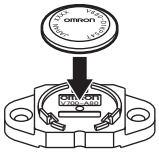
■ RF Tag Installation Direction

It is recommended that the RF Tag be mounted either by using the special V700-A80 Attachment or by using an adhesive.

▪ Installation by V700-A80 Attachment

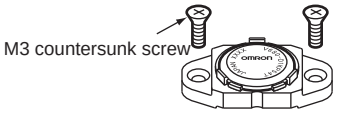
1. Insert the coin-shaped RF Tag into the Attachment.

The coin-shaped RF Tag has no directionality, so it can be faced in any direction.

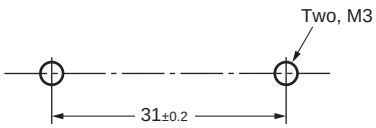


CHECK! Do not repeatedly insert and remove the RF Tag from the Attachment. Doing so an loosen the fit of the RF Tag and break the Attachment clasps. In case it should become necessary to remove an RF Tag once it has been inserted, do so by inserting a flat-blade screwdriver into the space between the Attachment and the RF Tag at the bottom of the Attachment. Do not use bare hands to remove the RF Tag, or the RF Tag may be damaged.

2. Use M3 screws to fasten the Attachment, and tighten the screws to a torque of 0.3 to 0.5 N·m.



Mounting hole dimensions



▪ Installation by adhesive

Please select the adhesive matched to the bonded material. And defend decided dosage and usage. And confirm and use the tidy fixation.

Because the material of RF Tag is PPS resin, the epoxy-based adhesives are recommended to bonding to the metal and the rigid plastic.

The epoxy adhesives listed in the following table are recommended for the given temperature ranges.

Ambient operating temperature	Product name	Manufacturer
-40 to 70°C	Two-part Epoxy-compound Resin: TB2001 (main agent)/TB2105C (curing agent)	Three Bond Co., Ltd.
	One-part Moisture-curing Elastic Adhesive TB1530	Three Bond Co., Ltd.
–40 to 110°C	Two-part Epoxy Resin: EP001	CEMEDINE Co., Ltd.
-40 to 150°C	One-part Epoxy Resin: TB2285	Three Bond Co., Ltd.
	Two-part Epoxy Resin: TB2087	Three Bond Co., Ltd.

CHECK! If the part to be bonded is made of polyethelene, polypropylene, or a Fluorine Resin-based or silicon-based resin, the above adhesive may not have sufficient.

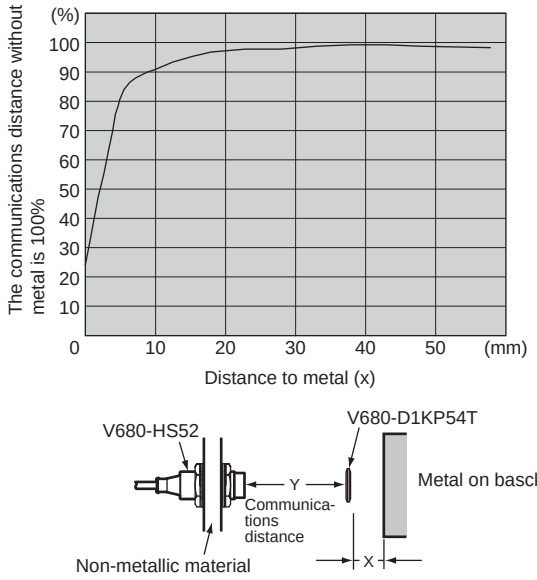
■ Effect of Metal behind RF Tags (Reference)

The V680-D1KP54T communications distance is reduced if there is any metal material behind the RF Tag.

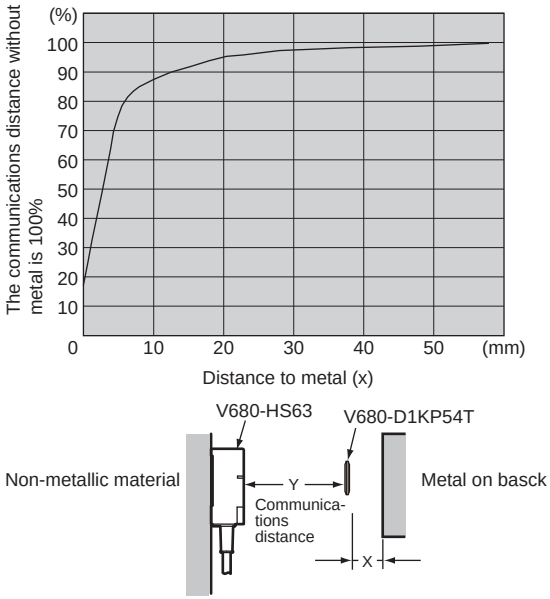
If the RF Tag is to be mounted to metal, then use a insert a non-metal spacer (such as plastic or resin). The relationship between the distance from the RF Tag to the metal surface and the communications distance is shown below.

The V700-A80 Attachment is 8 mm thick.

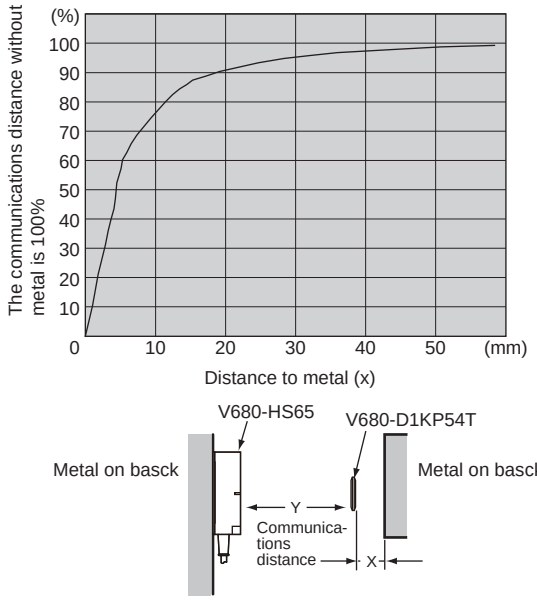
● V680-HS52 and V680-D1KP54T



● V680-HS63 and V680-D1KP54T

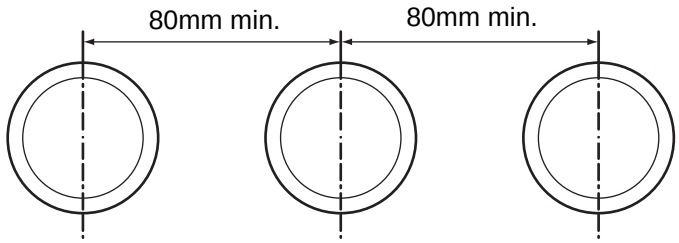


● V680-HS65 and V680-D1KP54T



■ Mutual Interference with RF Tags (Reference)

To prevent malfunctioning due to mutual interference when using more than one RF Tag, leave sufficient space between them as shown in the following diagram.



■ Influence of RF Tag Angle (Reference)

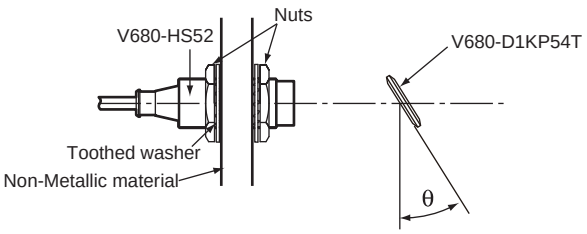
Install Antennas and RF Tags as parallel to each other as possible. Communications are possible even when an Antenna and a RF Tag are mounted at an angle, but the communications distance will be shortened. The relation between the angle and the communications distance is shown below.

▪ Percentage Drop in Communications Distance According to Angle of V680-D1KP54T

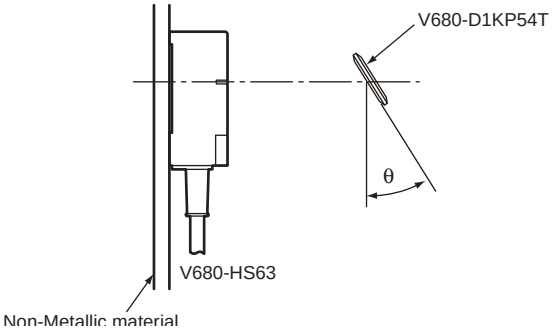
	RF Tag angle (θ°)				
	0	10	20	30	40
V680-HS52 and V680-D1KP54T	0%	0%	0%	0%	0%
V680-HS63 and V680-D1KP54T	0%	-1%	-1%	-2%	-4%
V680-HS65 and V680-D1KP54T	0%	-1%	-3%	-7%	-15%

▪ Measurement Conditions

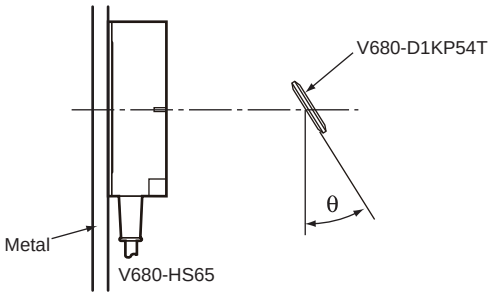
•V680-HS52 and V680-D1KP54T



• V680-HS63 and V680-D1KP54T



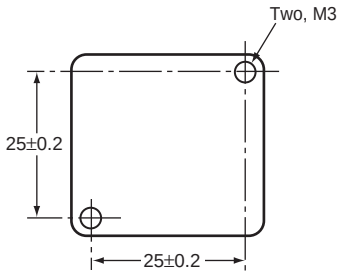
•V680-HS65 and V680-D1KP54T



V680-D1KP66T

■ RF Tag Installation Direction

Secure the RF Tag with M3 screws. Tighten the screws to a torque of 0.6 N·m or less..



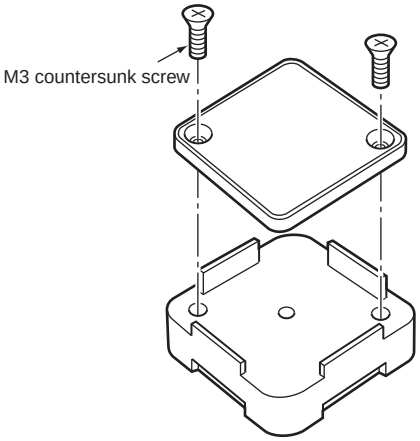
■ Effect of Metal behind RF Tags (Reference)

The V680-D1KP66T communications distance is reduced if there is any metal material behind the RF Tag.

If the RF Tag is to be mounted to metal, then either use a V600-A86 Attachment (sold separately) or insert a non-metal spacer (such as plastic or resin). The relationship between the distance from the RF Tag to the metal surface and the communications distance is shown below.

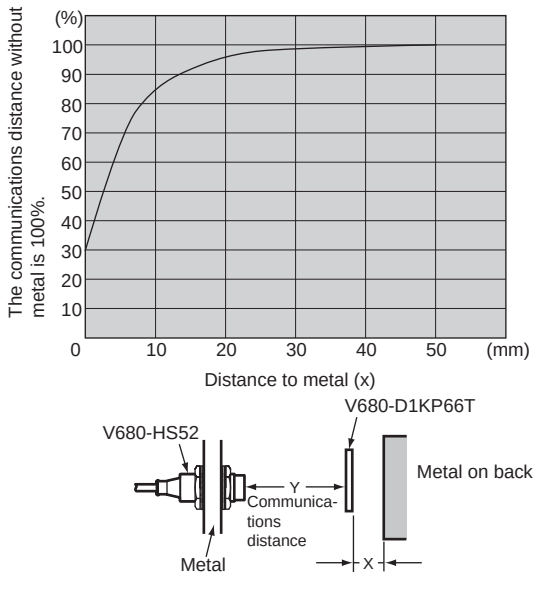
The Attachment is 10 mm thick, and more than one Attachment can be stacked.

V600-A86 Attachment Installation

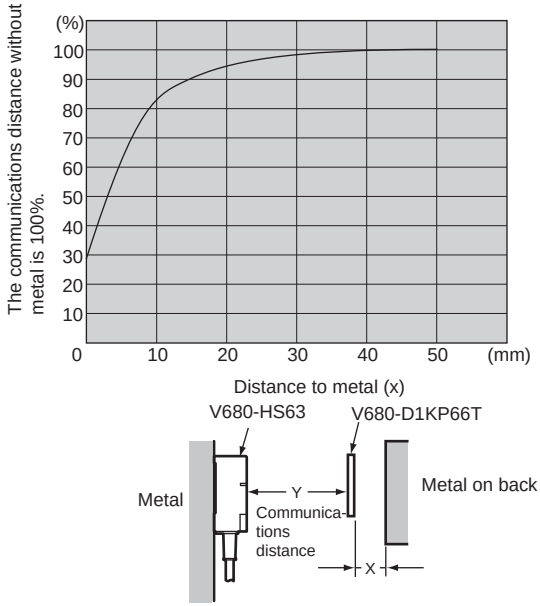


Install so that the mounting holes are aligned.

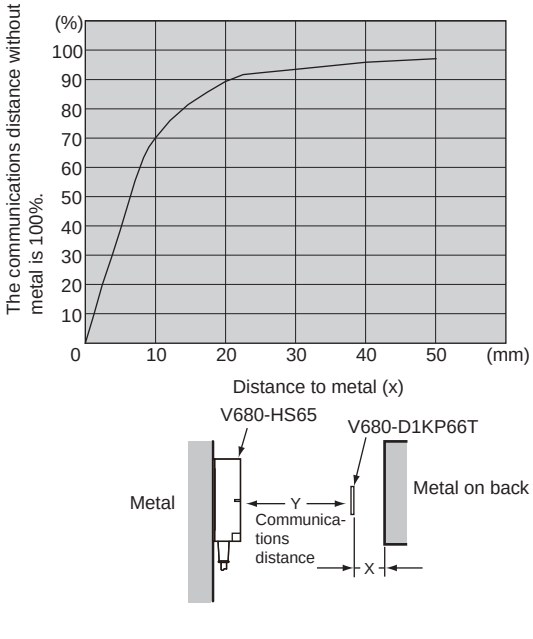
● V680-HS52 and V680-D1KP66T



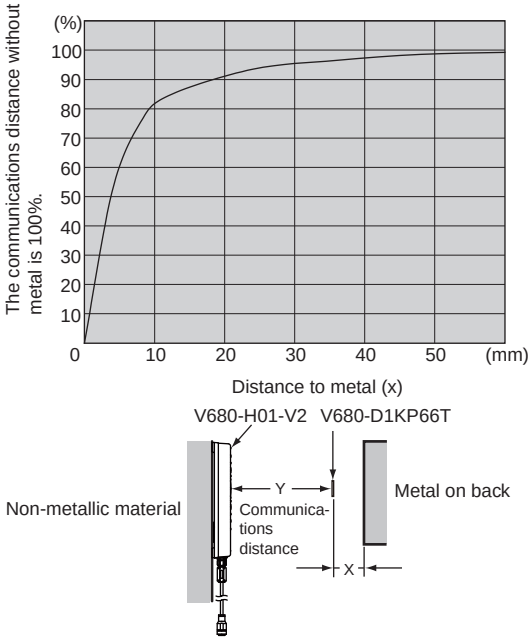
● V680-HS63 and V680-D1KP66T



● V680-HS65 and V680-D1KP66T



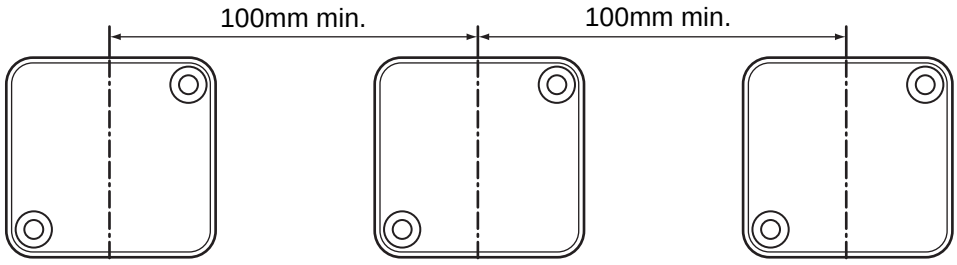
● V680-H01-V2 and V680-D1KP66T



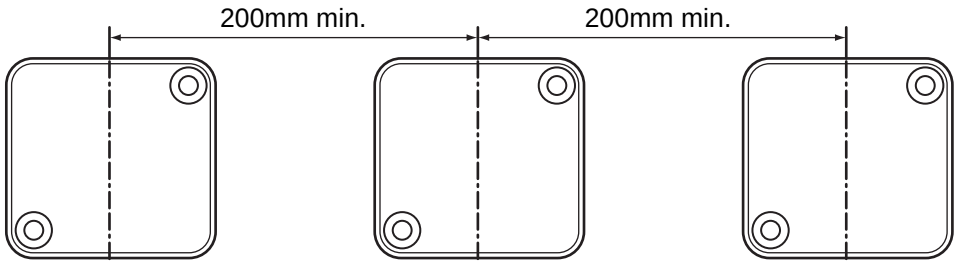
■ Mutual Interference with RF Tags (Reference)

To prevent malfunctioning due to mutual interference when using more than one RF Tag, leave sufficient space between them as shown in the following diagram.

• When V680-HS51, V680-HS52, V680-HS63, and V680-HS65 are Used



• When V680-H01-V2 are Used



■ Influence of RF Tag Angle (Reference)

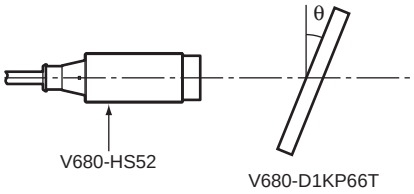
Install Antennas and RF Tags as parallel to each other as possible. Communications are possible even when an Antenna and a RF Tag are mounted at an angle, but the communications distance will be shortened. The relation between the angle and the communications distance is shown below.

▪ **Percentage Drop in Communications Distance According to Angle of V680-D1KP66T**

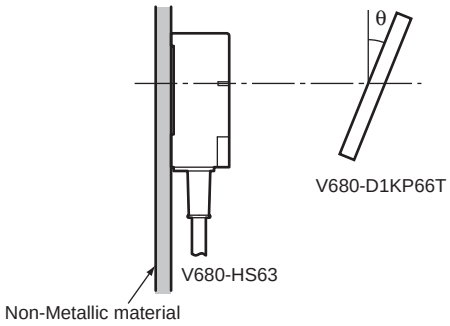
	RF Tag angle (θ°)				
	0	**10**	**20**	**30**	**40**
V680-HS52 and V680-D1KP66T	0%	-1%	-2%	-4%	-7%
V680-HS63 and V680-D1KP66T	0%	-2%	-3%	-5%	-9%
V680-HS65 and V680-D1KP66T	0%	-1%	-3%	-6%	-11%
V680-H01-V2 and V680-D1KP66T	0%	-1%	-3%	-8%	-12%

▪ **Measurement Conditions**

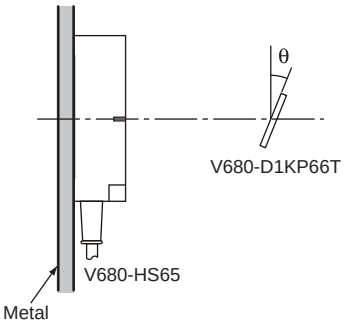
•V680-HS52 and V680-D1KP66T



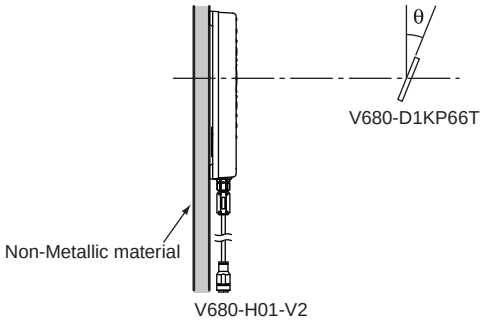
• V680-HS63 and V680-D1KP66T



•V680-HS65 and V680-D1KP66T



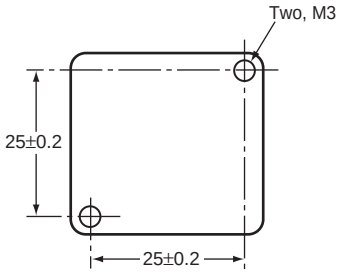
• V680-H01-V2 and V680-D1KP66T



V680-D1KP66MT

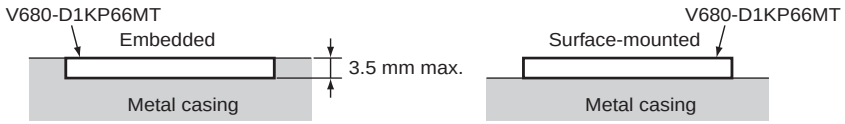
■ RF Tag Installation Direction

Mount the V680-D1KP66MT to a metal surface, and secure the RF Tag with M3 screws. Tighten the screws to a torque of 0.6 N·m or less.

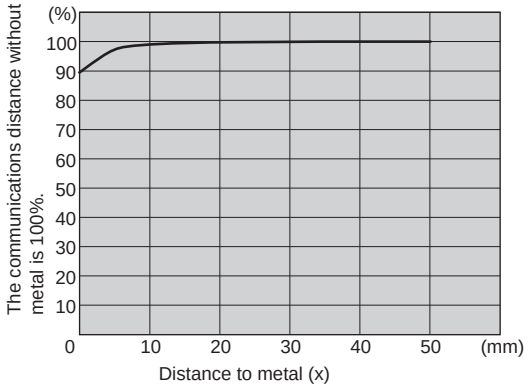


■ Effect of Surrounding Metals

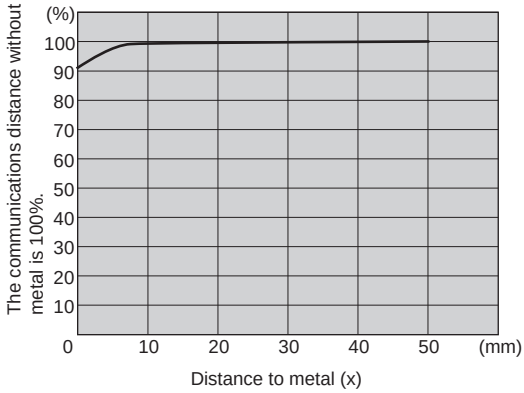
The V680-D1KP66MT can be surface-mounted or it can be embedded in metal. If it is embedded in metal, the height of the metal casing must not exceed that of the RF Tag.



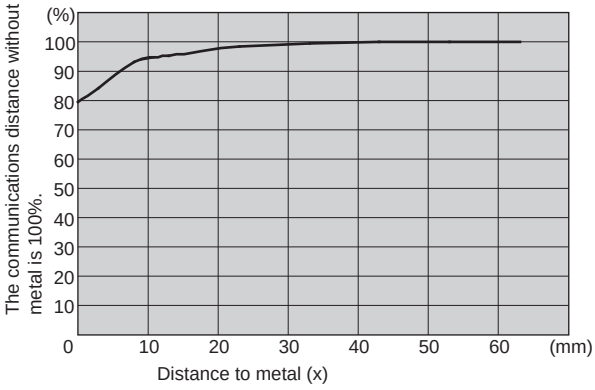
● V680-HS52 and V680-D1KP66MT

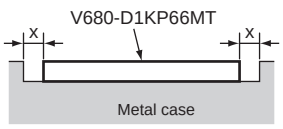


● V680-HS63 and V680-D1KP66MT



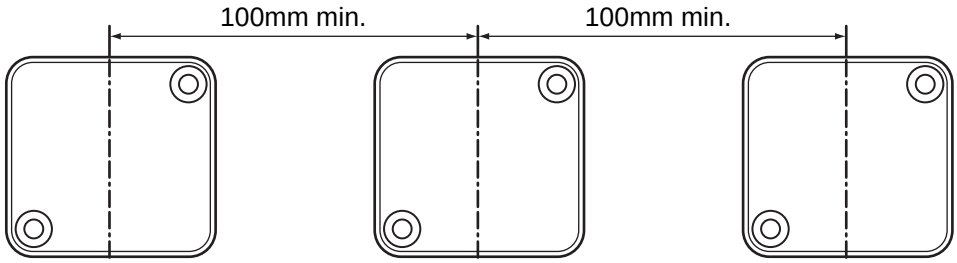
● V680-HS65 and V680-D1KP66MT





■ Mutual Interference with RF Tag (Reference)

To prevent malfunctioning due to mutual interference when using more than one RF Tag, leave sufficient space between them as shown in the following diagram.



■ Influence of RF Tag Angle (Reference)

Install Antennas and RF Tags as parallel to each other as possible. Communications are possible even when an Antenna and a RF Tag are mounted at an angle, but the communications distance will be shortened. The relation between the angle and the communications distance is shown below.

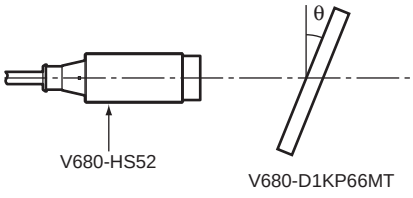
▪ **Percentage Drop in Communications Distance According to Angle of V680-D1KP66MT**

	RF Tag angle (θ°)				
	0	**10**	**20**	**30**	**40**
V680-HS52 and V680-D1KP66MT (Metal: Steel)	0%	-1%	-2%	-5%	-9%
V680-HS63 and V680-D1KP66MT (Metal: Steel)	0%	-1%	-4%	-7%	-13%
V680-HS65 and V680-D1KP66MT (Metal: Steel)	0%	-1%	-6%	-15%	-

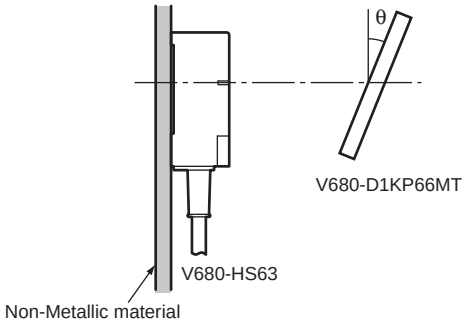
-: The measurement is no possible because the RF Tag comes in contact with the Antenna.

▪ **Measurement Conditions**

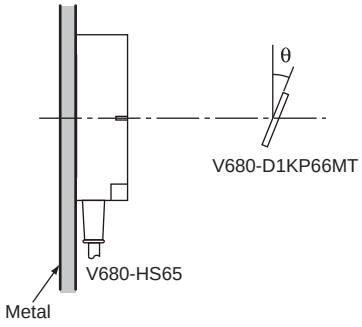
•V680-HS52 and V680-D1KP66MT (Metal: Steel)



• V680-HS63 and V680-D1KP66MT (Metal: Steel)



•V680-HS65 and V680-D1KP66MT (Metal: Steel)

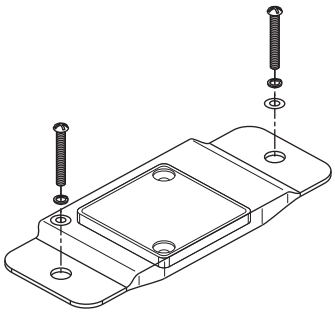


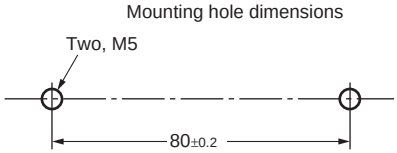
V680-D1KP66T-SP

■ RF Tag Installation Direction

Mount the RF Tags with M5 screws and washers.Tightening torque: 1.2 N·m.

There are no restrictions to the mounting direction of the RF Tags or the direction of movement for Antennas.

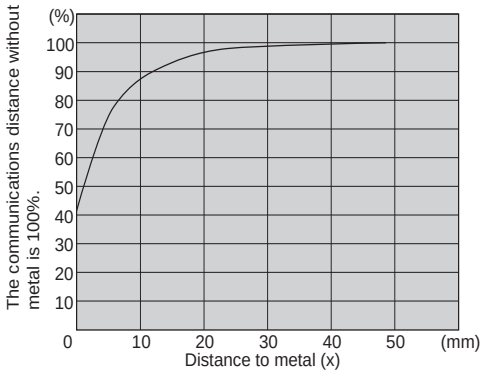


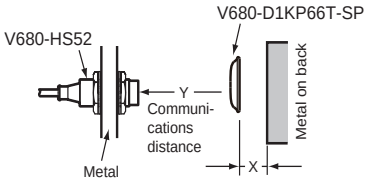


■ Effect of Metal behind RF Tags (Reference)

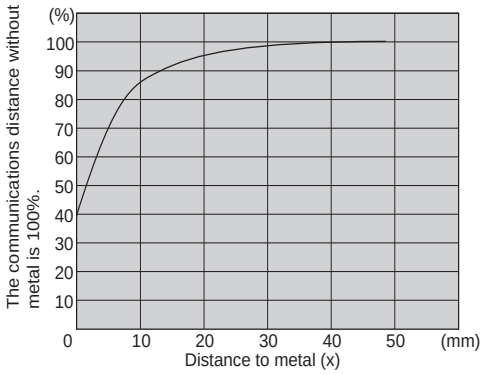
Mounting RF Tags to metal workpieces or palettes will affect the communications capabilities. Place non-metallic parts (e.g., plastic or resin) between the metallic parts by referring to the following relationship between the distance between the RF Tag and the metallic body versus the communications distance.

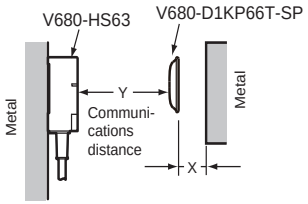
● V680-HS52 and V680-D1KP66T-SP



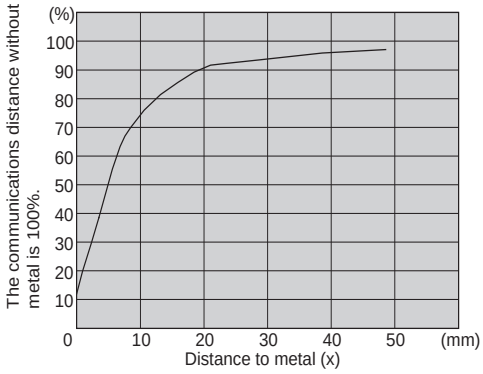


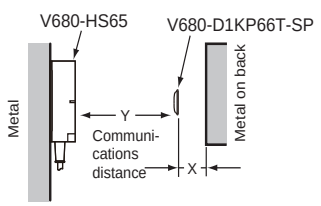
● V680-HS63 and V680-D1KP66T-SP





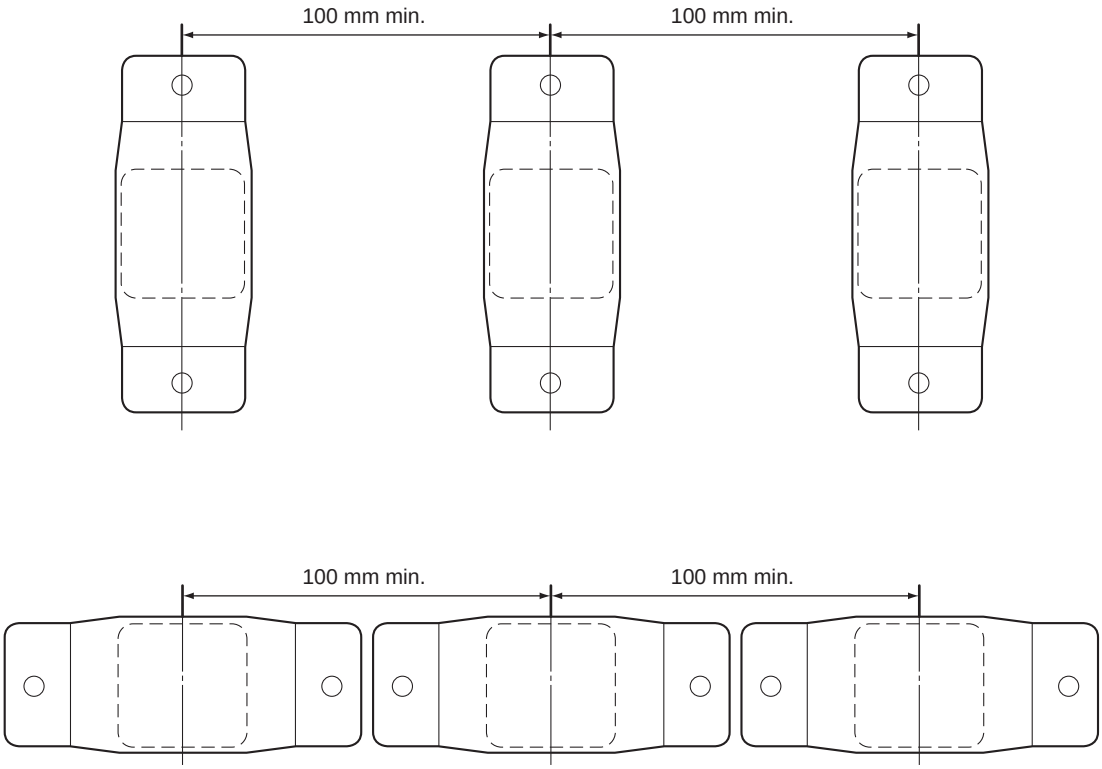
● V680-HS65 and V680-D1KP66T-SP





■ Mutual Interference with RF Tag (Reference)

To prevent malfunctioning due to mutual interference when using more than one RF Tag, leave sufficient space between them as shown in the following diagram.



■ Influence of RF Tag Angle (Reference)

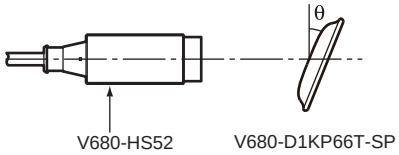
Install Antennas and RF Tags as parallel to each other as possible. Communications are possible even when an Antenna and a RF Tag are mounted at an angle, but the communications distance will be shortened. The relation between the angle and the communications distance is shown below.

▪ **Percentage Drop in Communications Distance According to Angle of V680-D1KP66T-SP**

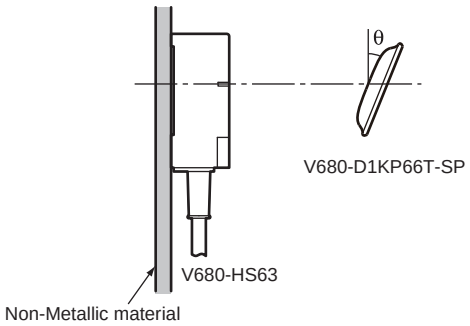
	RF Tag angle (θ°)				
	0	10	20	30	40
V680-HS52 and V680-D1KP66T-SP	0%	-1%	-2%	-4%	-7%
V680-HS63 and V680-D1KP66T-SP	0%	-2%	-3%	-5%	-9%
V680-HS65 and V680-D1KP66T-SP	0%	-1%	-3%	-6%	-11%

▪ **Measurement Conditions**

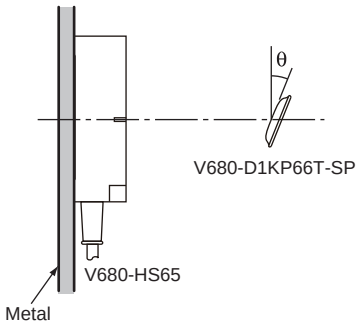
•V680-HS52 and V680-D1KP66T-SP



• V680-HS63 and V680-D1KP66T-SP



•V680-HS65 and V680-D1KP66T-SP

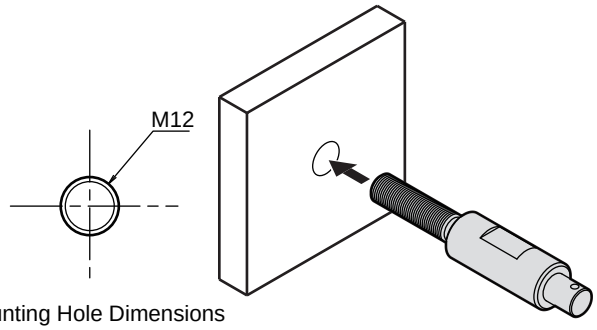


V680-D1KP58HTN

■ RF Tag Installation Direction

The RF Tags have a limited life span. Therefore, install them in locations in which they can be easily replaced. Use the following procedure to mount the V680-A80 Attachment when required.

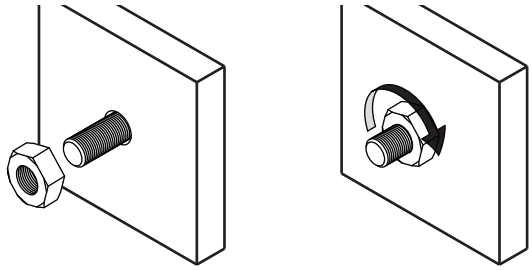
1. Mount the Attachment to the workpiece.



Mounting Hole Dimensions

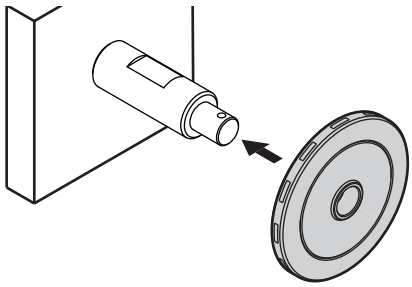
2. Tighten the lock nut.

CHECK! Use a tightening torque of 21 to 42 N·m.

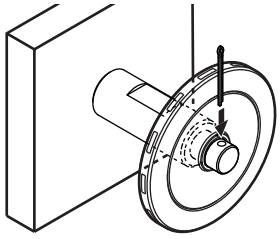


3. Mount the RF Tag to the Attachment.

CHECK! The RF Tag can be mounted in either direction.



Insert the split pin into the 3.2-dia. hole and open the tip of the pin to secure.



CHECK! Two nuts and one split pin are provided with the V680-A80 Attachment. Replacement split pins must be provided by the user.

Split pin	Nominal: 3.2 mm × 20 mm (length)

■ Influence of Metal Behind RF Tag (Reference)

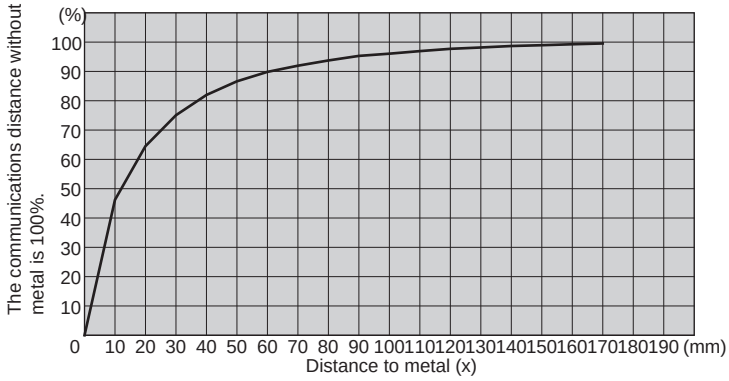
Take the influence of metal behind RF Tags into consideration when mounting them.

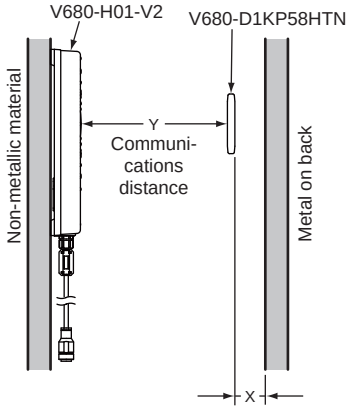
The communications distance is adversely affected if there is any metal material around the RF Tag. The degree of influence depends on the type, size, and shape of the material around the RF Tag. The following graphs show the influence of metal objects behind the RF Tag for reference.

• Influence of Metal

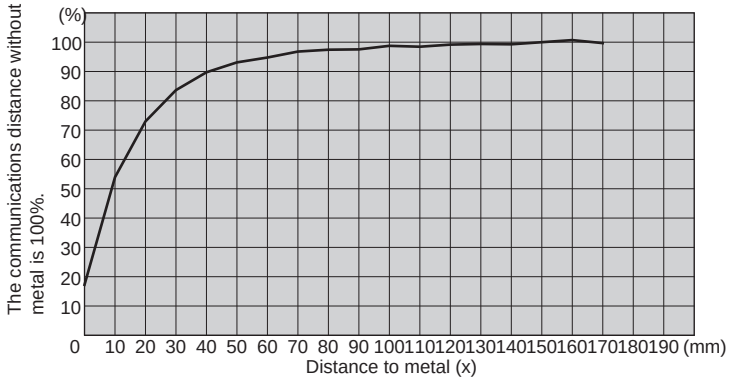
The following diagram shows the rate of reduction in the communications distance when metal is located behind the RF Tag. The horizontal axis in the diagram indicates the distance between the RF Tag and the metal plate, and the vertical axis indicates the relative communications distance at 100% without a metal plate, i.e, the rate of reduction in communications distance.

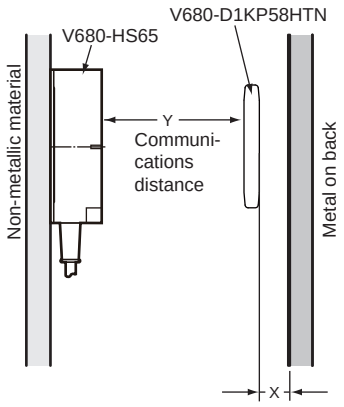
● V680-H01-V2 and V680-D1KP58HTN





● V680-HS65 and V680-D1KP58HTN





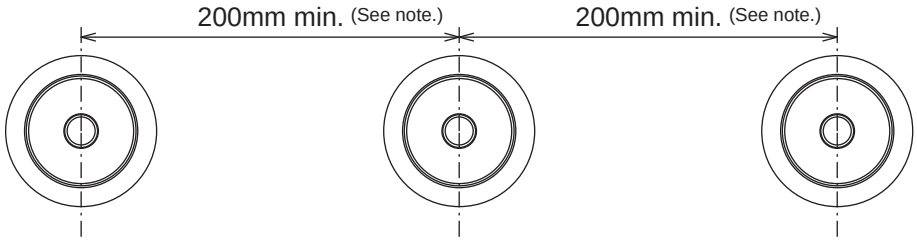
Material: Steel (t = 1.5 mm)

Shape: 295 mm × 295 mm

■ Mutual Interference with RF Tag (Reference)

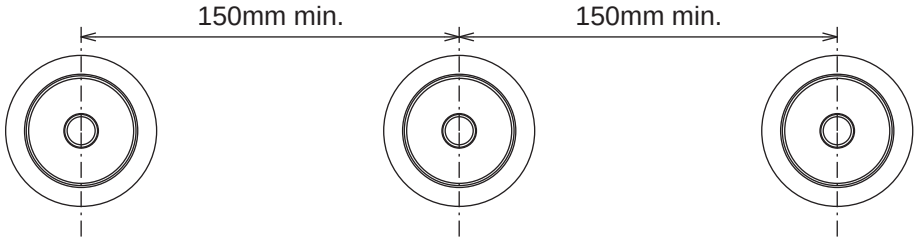
Provide the mounting distances indicated below to prevent malfunctions due to mutual interference when using multiple RF Tags.

▪ **When V680-H01-V2 is Used**



Note: Provide the interval of 250mm or more, when the communications distance of the antenna and RF Tag is 60mm or less.

▪ **When V680-HS65 is Used**



■ Influence of RF Tag Angle (Reference)

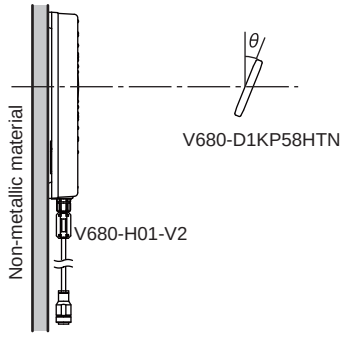
The maximum communications distance can be obtained when the Antenna and RF Tag are installed in parallel. When the RF Tag is installed on an angle, the communications distance is reduced. Consider the effect of the RF Tag angle when installing the RF Tag. As reference data, the following diagram shows the rate of reduction in communications distance according to the RF Tag angle. The horizontal axis indicates the angle when the RF Tag surface and Antenna surface are in parallel at 0°. The vertical axis indicates the relative communications distance when the angle is 0° at 100%, i.e., the rate in reduction of the communications distance.

▪ **Percentage Drop in Communications Distance According to Angle of V680-D1KP58HTN**

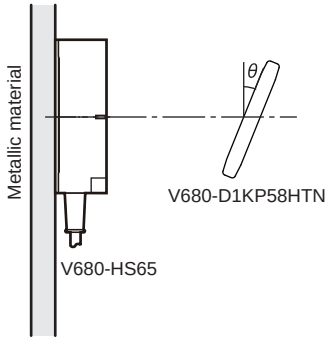
	RF Tag angle (θ°)								
	0	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**
V680-H01-V2 and V680-D1KP58HTN	0%	-2%	-5%	-10%	-15%	-20%	-30%	-40%	-60%
V680-HS65 and V680-D1KP58HTN	0%	0%	0%	0%	-1%	-3%	-5%	-18	-36%

▪ **Measurement Conditions**

• V680-H01-V2 and V680-D1KP58HTN



• V680-HS65 and V680-D1KP58HTN



Section 5
Chemical Resistance

Chemical Resistance of the Antennas	96
Chemical Resistance of RF Tags	97
Degree of Protection	101

Chemical Resistance of the Antennas

Applicable Models

V680-HS51 V680-HS52-W/R V680-HS63-W/R V680-HS65-W/R V680-H01-V2

ABS resin is used for case material and epoxy resin for filling material. Refer to the following lists and do not use chemicals that affect ABS and epoxy resin.
RF Tags cannot be used in applications with explosion-proof specifications.

■ Chemicals That Cause Deformations, Cracks, Etc.

ABS resin	Epoxy resin
Trichlene, acetone, xylene, toluene, gasoline, creosol, methylene chloride, phenol, cyclohexane, aqua regia, chromic acid, sulfuric acid (90% RT), methyl ethyl ketone, aniline, nitrobenzine, monochlorobenzine, pyridine, nitric acid (60% RT), formic acid (80% RT)	Aqua regia, chromic acid, sulfuric acid (90% RT), nitric acid (60% RT), ammonia solution, acetone, methylene chloride, phenol

■ Chemicals That May Cause Discoloration, Swelling, Etc.

ABS resin	Epoxy resin
Hydrochloric acid, alcohol, Freon, sodium hydroxide, hydrogen peroxide, benzine, sulfuric acid (10% RT), nitric acid (10% RT), phosphoric acid (85% RT), ammonia solution	Sulfuric acid (10% RT), nitric acid (10% RT), hydrochloric acid (30% RT), acetic acid (50% RT), oxalic acid, calcium hydroxide, benzine, creosol, alcohol, cyclohexane, toluene, xylene, benzine, grease

■ Chemicals That Do Not Affect ABS Resin or Epoxy Resin

ABS resin	Epoxy resin
Ammonia, kerosine, mineral oil, developer, Yushiroken S50, Chemi-Cool Z, Velocity No. 3, Yushiroken EEE-30Y, petroleum, grease, acetic acid, oxalic acid, calcium hydroxide, phosphoric acid (30% RT), hydrochloric acid (10% RT), potassium hydroxide	Ammonia, hydrochloric acid (10% RT), potassium hydroxide, petroleum, gasoline, Yushiroken S50, Chemi-Cool Z, Velocity No. 3, Yushiroken EEE-30Y

Note: The above results are from tests conducted a room temperature (23°C). Even if the chemicals do not affect the ABS or epoxy resins at room temperature, they may affect the resins at higher or lower temperatures. Check the chemicals carefully in advance.

Chemical Resistance of RF Tags

Applicable Model

V680-D1KP52MT V680-D1KP52M-BT01 V680-D1KP52M-BT11 V680-D1KP53M

PPS resin is used for case material and epoxy resin for filling material. Refer to the following lists and do not use chemicals that affect PPS and epoxy resin.
RF Tags cannot be used in applications with explosion-proof specifications.

■ Chemicals That Cause Deformations, Cracks, Etc.

PPS resin	Epoxy resin
Aqua regia	Aqua regia, chromic acid, sulfuric acid (90% RT), nitric acid (60% RT), ammonia solution, acetone, methylene chloride, phenol

■ Chemicals That May Cause Discoloration, Swelling, Etc.

PPS resin	Epoxy resin
Nitric acid (60% RT)	Sulfuric acid (10% RT), nitric acid (10% RT), hydrochloric acid (30% RT), acetic acid (50% RT), oxalic acid, calcium hydroxide, benzine, creosol, alcohol, cyclohexane, toluene, xylene, benzine, grease

■ Chemicals that Do Not Affect PPS Resin or Epoxy Resin

PPS resin	Epoxy resin
Hydrochloric acid (37%RT), sulfuric acid (98%RT), nitric acid (40%RT), Hydrogen fluoride solution (40%RT), chromic acid (40%RT), hydrogen peroxide (28%RT), sodium hydroxide solution (60%RT), ammonia solution (28%RT), sodium chloride (10%RT), sodium carbonate (20%RT), sodium hypochlorite, phenol solution (5%RT), glacial acetic acid, acetic acid, oleic acid, Methyl alcohol (95%RT), ethyl alcohol (95%RT), Ethyl acetate, sebacic acid, diethylhexyl, acetone, diethyl ether, n-heptane, 2-2-4 trimethylpentane, benzine, toluene, aniline, mineral oil, gasoline, insulating oil, dichloroethylene, carbon tetrachloride	Ammonia, hydrochloric acid (10% RT), potassium hydroxide, petroleum, gasoline, Yushiroken S50, Chemi-Cool Z, Velocity No. 3, Yushiroken EEE-30Y, methyl ethyl ketone, sodium hydroxide (10%RT)

Note: The above results are from tests conducted a room temperature (23°C). Even if the chemicals do not affect the PPS or epoxy resins at room temperature, they may affect the resins at higher or lower temperatures. Check the chemicals carefully in advance.

Applicable Models

V680-D1KP54T V680-D1KP66T/66MT V680-D1KP58HTN

PPS resin is used for case material. Refer to the following lists and do not use chemicals that affect PPS and epoxy resin.
RF Tags cannot be used in applications with explosion-proof specifications.

Chemical		At room temperature	At 90°C
Hydrochloric acid	37%	A	A
	10%	A	A
Sulfuric acid	98%	A	B
	50%	A	A
	30%	A	A
	3%	A	A
Nitric acid	60%	B	C
	40%	A	B
	10%	A	A
Hydrogen fluoride solution	40%	B	B
Chromic acid	40%	A	A
Hydrogen peroxide solution	28%	A	B
	3%	A	A
Sodium hydroxide solution	60%	A	A
	10%	A	A
	1%	A	A
Ammonia solution	28%	A	B
	10%	A	B
Sodium chloride	10%	A	A
Sodium carbonate	20%	A	A
	2%	A	A

Chemical		At room temperature	At 90°C
Sodium hypochlorite		A	A
Phenol solution	5%	A	A
Glacial acetic acid		A	A
Acetic acid		A	A
Oleic acid		A	A
Methyl alcohol	95%	A	A
Ethyl alcohol	95%	A	A
Ethyl acetate		A	A
Sebacic acid diethylhexyl		A	A
Acetone		A	A
Diethyl ether		A	A
n-heptane		A	A
2-2-4 trimethylpentane		A	A
Benzene		A	A
Toluene		A	A
Aniline		A	A
Mineral oil		A	A
Gasoline		A	A
Insulating oil		A	A
Dichloroethylene		A	A
Carbon tetrachloride		A	A

A: Has no adverse effect, B: May cause discoloration, swelling, etc., C: Causes deformation, cracks, etc.

CHECK!

The above table shows the extent of changes in PPS resin exposed to each chemical at room temperature and at 90°C. If actual chemicals, concentrations, and temperatures are different from those shown in the tables, always conduct tests under the actual conditions in which the RF Tags are to be used.

Applicable Models

V680-D1KP66T-SP

PFA resin is used for exterior case material. Refer to the following lists and do not use chemicals that affect PFA resin.
RF Tags cannot be used in applications with explosion-proof specifications.

■ Chemical Resistance of Fluoroplastic PFA (Reference)

PFA: Tetrafluorethylene-Perfluoroalkylvinyletheir Copolymer

Fluoroplastic PFA does not react with most chemicals except molten alkali metal, hot pressurized fluorine (F_2), and some halogen derivatives. The following tables show the results of tests in which PFA was soaked in or exposed to commonly used organic and inorganic chemicals. In these tests, a compression-molded test piece (1.3 mm thick) was soaked in the chemical at a specified temperature for a week (168 houre) and taken out of the chemical, then the weight change, tensile strength, and elongation of the test piece were immediately measured. If the change in the tensile strength is 15 % or less, the cange in the elongation is 10 % or less, and the increase in the weight is less than 0.5 %, the results of the test can be considered normal.
If PFA is exposed to trichloroacetic acid, tri-n-butyl phosphate, perchloroethylene, carbon thtrachloride, and other liquids (which easily make resin surfaces wet) at a high temperature, it tends to increase its weight due to absorption and reduce its tensile strength. Even when PFA absorbs chemicals and solvents, its molecular structure will not change, If, however, PFA is subject to temperature or pressure changes or mechanical damage when it has absorbed chemicals, the chemicals will repeatedly expand and contract inside pfa, causing mechanical problems such as cracks and bulging. In fact, this problem occurs with any kind of plastic.

▪ Inorganic Chemicals

Chemical name	Test temperature (°C)	Resulting characteristics (%)		Weight increase rate (%)
		Tensile strength	Elongation	
concentrated hydrochloric acid	120	98	100	0.0
Concentrated sulfuric acid	120	95	98	0.0
Hydrofluoric acid (60%)	23	99	99	0.0
Fuming sulfuric acid	23	95	96	0.0
Aqua regia	120	99	100	0.0
Chromic acid (50%)	120	93	97	0.0
Consentrated nitric acid	120	95	98	0.0
Fuming nitric acid	23	99	99	0.0
Concentrated ammonia solution	66	98	100	0.0
Caustic soda (50%)	120	93	99	0.4
Hydrogen peroxide solution (30%)	23	93	95	0.0
Bromine	23	99	100	0.5
Chlorine	120	92	100	0.5
Ferrous chloride (25%)	100	93	98	0.0
Zinc chloride (25%)	100	96	100	2.7
Chlorosulfonic acid	151	91	100	2.7
Concentrated phosphoric acid	100	93	100	0.0

▪ Organic Chemicals

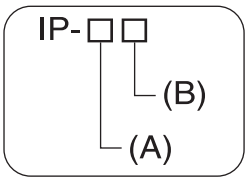
Chemical name	Test temperature (°C)	Resulting characteristics (%)		Weight increase rate (%)
		Tensile strength	Elongation	
Glacial acetic acid	118	95	100	0.4
Acetic anhydride	139	91	99	0.3
Trichloroacetic acid	196	90	100	2.2
Isooctane	99	94	100	0.7
Naphtha	100	91	100	0.5
Mineral oil	180	87	95	0.0
Toluene	110	88	100	0.7
o-creosol	191	92	96	0.2
Nitrobenzene	210	90	100	0.3
Benzyl alcohol	205	93	99	0.3
Aniline	185	94	100	0.3
n-butylamine	78	86	97	0.4
Ethylenediamine	117	96	100	0.1
Tetrahydrofuran	66	88	100	0.1
Benzaldehyde	179	90	99	0.5
Cyclohexane	156	92	100	0.4
Methyl ethyl ketone	80	90	100	0.4
Acetophenone	202	90	100	0.6
Dimethylphtalate	200	98	100	0.3
n-butyl acetate	125	93	100	0.5
Tri-n-butyl phosphate	200	91	100	2.0
Methylene chloride	40	94	100	0.8
Perchloroethylene	121	86	100	2.0
Carbon tetrachloride	77	87	100	2.3
Dimethyl formamide	154	96	100	0.2
Dimethyl sulfoxide	189	95	100	0.1
Dioxane	101	92	100	0.6
Reference: *Fluoroplastics Handbook*, The Nikkan Kogyo Shimbun Ltd. (Takaomi Satogawa)				

Degree of Protection

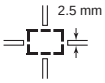
Ingress protection degrees (IP-□□) are determined by the following tests. Be sure to check the sealing capability under the actual operating environment and conditions before actual use.

IP indicates the ingress protection symbol.

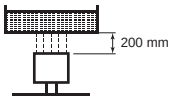
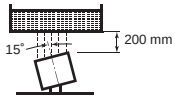
■ IEC (International Electrotechnical Commission) Standards IEC 60529: 2001

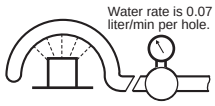
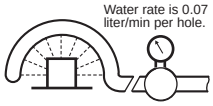
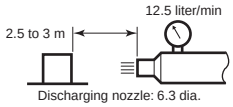
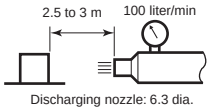
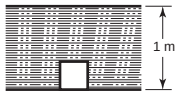


(A) First Digit: Degree of Protection from Solid Materials

Degree	Degree	
0		No protection
1		Protects against penetration of any solid object such as a hand that is 50 mm or more in diameter.
2		Protects against penetration of any solid object, such as a finger, that is 12.5 mm or more in diameter.
3		Protects against penetration of any solid object, such as a wire, that is 2.5 mm or more in diameter.
4		Protects against penetration of any solid object, such as a wire, that is 1 mm or more in diameter.
5		Protects against penetration of dust of a quantity that may cause malfunction or obstruct the safe operation of the product.
6		Protects against penetration of all dust.

(B) Second Digit: Degree of Protection Against Water

Degree	Protection		Test method (with pure water)
0	No protection	Not protected against water.	No test
1	Protection against water drops	Protects against vertical drops of water towards the product.	Water is dropped vertically towards the product from the test machine for 10 min. 
2	Protection against water drop	Protects against drops of water approaching at a maximum angle of 15×Åto the left, right, back, and front from vertical towards the product.	Water is dropped for 2.5 min each (i.e., 10 min in total) towards the product inclined 15× to the left, right, back, and front from the test machine. 

Degree	Protection		Test method (with pure water)
3	Protection against sprinkled water	Protects against sprinkled water approaching at a maximum angle of 60× from vertical towards the product.	Water is sprinkled for 10 min at a maximum angle of 60× to the left and right from vertical from the test machine. 
4	Protection against water spray	Protects against water spray approaching at any angle towards the product.	Water is sprayed at any angle towards the product for 10 min from the test machine. 
5	Protection against water jet spray	Protects against water jet spray approaching at any angle towards the product.	Water is jet sprayed at any angle towards the product for 1 min per square meter for at least 3 min in total from the test machine. 
6	Protection against high pressure water jet spray	Protects against high-pressure water jet spray approaching at any angle towards the product.	Water is jet sprayed at any angle towards the product for 1 min per square meter for at least 3 min in total from the test machine. 
7	Protection underwater	Resists the penetration of water when the product is placed underwater at specified pressure for a specified time.	The product is placed 1 m deep in water (if the product is 850 mm max. in height) for 30 min. 
8 (See Note)	Protection underwater	Can be used continuously underwater.	The test method is determined by the manufacturer and user.

Note: OMRON Test Method

Usage conditions: 10 m or less under water in natural conditions

1.No water ingress after 1 hour under water at 2 atmospheres of pressure.

2.Communications performance must be met after 100 repetitions of 30 minutes in 5°C water and 30 minutes in 85°C water.

■ Oil resistance (OMRON in-house standard)

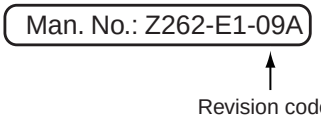
Protection	
Oil-resistant	No adverse affect from oil drops or oil spray approaching from any direction.
Oil-proof	Protects against penetration of oil drops or oil spray approaching from any direction.

Note: This OMRON in-house standard confirms resistance to cutting and other oils. It is equivalent to the former JEM standard.

MEMO

Revision History

A manual revision code appears as a suffix to the catalog number at the bottom of the front and rear pages.



Revision code	Date	Revised contents
01	May 2007	Original production
02	July 2007	Added item for V680-HS65 Antenna, and the overseas regulations and standards.
02A	September 2007	Added information on metal on back surface of the V680-HS65, corrected RF Tag specifications, and made other minor corrections.
03	December 2007	Added item for V680-HS51 Antenna, V680-D1KP66T-SP RF Tag, the overseas regulations and standards, and made other minor corrections.
03A	June 2008	Added item for the overseas regulations and standards, and made other minor corrections.
04	November 2008	Added item for V680-H01-V2 Antenna, V680-D1KP58HT RF Tag, and made other minor corrections.
05	February 2009	Added item for V680-D1KP53M RF Tag, and made other minor corrections.
06	April 2010	Added item for V680-D1KP54T RF Tag, and made other minor corrections.
07	January 2012	Added items for V680-D1KP52M-BT01/-D1KP52M-BT11 RF Tag. Deleted the related information on the overseas regulations and standards. Made other minor corrections.
08	May 2012	Minor changed.
09	November 2012	Added item for V680-D1KP58HTN RF Tag, and made other minor corrections.
09A	February 2013	Minor changed.

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